

THE
LEPIDOPTERA
OF THE
BRITISH ISLANDS
VOL. VI.



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THE
LEPIDOPTERA
OF THE
BRITISH ISLANDS

*A DESCRIPTIVE ACCOUNT OF THE FAMILIES, GENERA, AND
SPECIES INDIGENOUS TO GREAT BRITAIN AND
IRELAND, THEIR PREPARATORY STATES,
HABITS, AND LOCALITIES*

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HETEROCERA
NOCTUINA—GEOMETRINA



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LEPIDOPTERA.

DIVISION II.—HETEROCERA.

Group 3. *NOCTUINA*.

Family 2. **TRIFIDÆ.**

Genus 77. **HOPORINA.**

Antennæ ciliated; eyes naked, with front and back lashes; thorax helmeted or raised to a pointed and ridged cone; abdomen decidedly flattened, not crested; costa of fore wings arched at the base and apex, hind margin retuse, expanded below; hind wings thin and delicate, crossbar and vein 5 almost imperceptible.

We have but one species.

1. **H. croceago**, *Schiff.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings with the costa a little hollowed in the middle, arched at the base; colour rich orange with a Y-shaped central stripe; hind wings white tinted with pink.

Antennæ of the male simple, almost naked, orange-red; palpi porrected, conical, narrowly tufted, purplish-orange; eyes naked, brown; head pointed, smooth, orange-yellow dusted with brown; collar erect, thrust forward in the middle by an upright pointed conical tuft, single and slightly ridged behind, whole thorax rich orange, having a few small black dots along the margins of the shoulder lappets; fascicles white; abdomen also white, broad and much flattened but

short, lateral tufts spreading, anal tuft small and flat, white. Fore wings retuse, costa arched at the base, and rounded toward the apex, but faintly hollowed in the middle; apex angulated, almost squared; hind margin below it straight or slightly retuse, perpendicular, full at the middle, thence a little rounded off, but with full anal angle; dorsal margin straight to near the base; colour rich orange-yellow; extreme edge of the middle portion of the costa pure white, and there is a tuft of white scales at the base of the dorsal margin; basal line slender, often hardly perceptible, curved, leaden-black; first line faintly indicated by a black dot each on the subdorsal and median nervures, and an angulated streak above; second line by a regular series of black dots; before it is a more noticeable slender central shade, very oblique, forked round the reniform stigma so as to form a long Y, and composed of leaden-black clouding or minute dots; the spiracular line is a mere thread of similar atoms, rather bent in the middle and scarcely attaining the margins; orbicular and reniform stigmata obscure and very similar, being mere rounded spots of rather paler orange than the general colour; cilia concolorous. Hind wings rather small with sinuous hind margin; white, with a small pinkish central spot, followed and partly surrounded by an irregular series of pink connected lunules and threads; cilia white. Female so accurately similar that it is difficult to separate the sexes.

Underside of the fore wings silky white tinged with orange, and dusted with brown along the costa, apex, and hind margin; the Y-mark of the upper side faintly visible; beyond it is a faint partial dotted brown line. Hind wings white, the costal region dusted with orange; central spot lunate, pink, followed by a slender undulating pink transverse line. Body and leg-tufts white tinged with orange; tibiæ orange, barred with white.

Very constant in colour, or only occasionally a little paler, but there is some little variation in the distinctness

of the stigmata and the central shade. Some individuals reared at Bury St. Edmunds, Suffolk, by Mr. F. Norgate, are of a very unusual reddish-orange colour.

On the wing in September, October, and occasionally the beginning of November, and after hybernation from March till May, and even later. I have seen a specimen, undoubtedly old and hybernated, which was captured in July.

LARVA cylindrical, the twelfth segment slightly raised; head large, rounded and flattened in front, pinkish-brown reticulated with darker; body dull yellow, reddish-yellow, dull orange, or pale yellow, irrorated with pale brown; a series of prominent **V**-shaped pale brown dorsal markings from the fifth to the twelfth segments, and pointing backwards, is intersected by an interrupted pale yellow dorsal line, and frequently shaded externally with a brighter or paler tint of the ground colour; the **V** on the twelfth segment is abruptly terminated by two lemon-coloured spots which cause it to appear wedge-shaped; usual raised dots of the ground colour, or paler, distinctly encircled with grey; spiracles black, each placed in a brown shade; prolegs tinged with pink. (C. Fenn.)

April to June or the beginning of July, on oak—apparently preferring oak underwood.

PUPA highly polished, rounded, semi-transparent; anal extremity blunt, with a minute terminal bristle; colour bright orange or red-brown. In a soft compact cocoon of silk and sand, on or close to the surface of the ground. In it the larva remains for a considerable time before assuming the pupa state. (C. Fenn.)

This exquisitely beautiful moth conceals itself during the day among dead leaves, to which it bears a close resemblance. At dusk it will come to sugar, ivy-bloom, hop-blossom, ripe blackberries, or rotten apples, in the autumn; and to sallow-bloom in the spring, frequenting this favoured food as long

as it continues available. I know of no other *Noctua* of such exceedingly gentle, placid habits as this: it continues to move about until it fades to a pale yellow, and even until the scales gradually wear off its wings, yet scarcely ever becomes ragged or shows any indication of rough contact with leaves, grass, or any substance likely to damage it. Moreover, it is comparatively indifferent to weather, and will quietly visit its favourite food during cold winds and heavy rain. Never very common, but found in and near open woods in Kent, Sussex, Surrey, Middlesex, Hants, Devon; rarely in Dorset, Cornwall, Somerset, and Gloucestershire; also in Herts, Herefordshire, and Worcestershire. In Wales it has been taken in Glamorganshire, and by Col. Partridge at Dolgelly. I have no knowledge of its occurrence elsewhere in the British Isles. Abroad it is found throughout Central Europe, Northern Italy, Spain, and Northern Turkey, but probably has a far more extensive range, since it occurs in Japan. Specimens from that country have received the name of *sericca*.

Genus 78. **DASYCAMPA.**

Antennæ ciliated; eyes naked, with long front and thick back lashes; thorax faintly crested; abdomen rather flattened, without crests, but having colour-imitations; fore wings truncate, spotted, but without definite markings; hind wings broad, blackened; discal cell very broad, cross-bar curved; vein 5 very faint.

We have but one species.

1. **D. rubiginea**, *Schiff.*—Expanse $1\frac{3}{8}$ to $1\frac{1}{2}$ inch. Fore wings truncate, smooth, orange-ochreous, abundantly dusted with orange-red, and with black; a black central spot and a row of black dots along the hind margin being well marked; cilia also spotted. Hind wings black-brown with red cilia.

Antennæ of the male thick, notched, thickly ciliated in fine tufts, red-brown; palpi strongly tufted, pointed, red-brown; eyes black-brown; head densely tufted, pale fulvous

with a black bar across the face below the antennæ; thorax fulvous, the collar edged with dark red and having on each side a black dot; fascicles dusky-white; abdomen much flattened, pale ochreous with a dusky-black band across each segment, and on the basal segments long dull yellow hair-scales in which are one or two dorsal orange-red dots imitating crests; lateral tufts small but continuous; anal tuft broad and flat, pale ochreous. Fore wings truncate; costa very faintly arched; apex squarely angulated; hind margin perpendicular and straight to below the middle, thence rounded off; dorsal margin faintly rounded; colour smooth orange-ochreous or pale orange-red abundantly dotted with black, and dotted and clouded with orange-red, but the normal pattern of markings is thereby confused and rendered obscure or scarcely noticeable; basal line indicated by pairs of black dots; first line in the same manner, but toward the dorsal margin these coalesce into two pairs of crescents; second line indicated by a row of black dots which is tolerably direct and not very oblique, followed by two more parallel rows; subterminal line also a row of deep black dots obscured by an edging of red clouds, but two of the dots placed just above the middle are large and conspicuous; stigmata not very perceptible, mere pale clouds, except that a large and conspicuous black spot is placed in the basal portion of the reniform; sometimes the orange-red clouding forms a sort of central shade; extreme hind margin edged with small black lunules; cilia purplish-ochreous, spotted with reddish-black. Hind wings not large, having a sinuous hind margin; colour smoky-black; cilia orange-red. Female quite similar, the anal tuft narrower.

Underside of forewings dull pale ochreous, the middle area clouded with smoky black, in which is a deep black spot; some of the nervures are streaked with glossy pink; hind margin dotted with black. Hind wings also dull pale ochreous; central spot large, lunate, black; beyond it is a slender orange-red transverse line; hind margin dusted with

red, and preceded by two or three small smoky-black clouds toward the apex. Body and legs pale ochreous ; tibiæ barred and tipped with purple-red.

Slightly variable in the degree of black dotting over the surface of the fore wings and rather more so in the orange-red dappling ; sometimes this colour in a great measure suffuses the whole surface, in which case the black dots are diminished in number or almost obliterated, and in one form, well known on the Continent, the colour is smooth orange-chestnut without other markings except small black dots in the reniform stigma and along the hind margin. The nearest approach to this variety which I have seen here has been obtained in Somersetshire ; as also has a somewhat similar but deeper red form, almost unicolorous, but having one or two white dots on the costa ; and another suffused with red-brown.

On the wing in October and November, going into hibernation only when the cold becomes severe, appearing again from the end of February till April ; but when reared in captivity almost every individual seems to emerge in August or September.

LARVA $1\frac{1}{4}$ inch in length when at rest, but more than $1\frac{1}{2}$ when in motion, having unusual power of self-extension and contraction ; stoutest at the twelfth segment and thence tapering regularly to the head, which is the smallest ; the thirteenth tapering rapidly behind, the anal pair of prolegs remarkably close together ; the skin is soft, and each segment swells out plumply in the middle. When full grown the head is intensely black ; the body purplish-brown, glistening in certain lights with a faint, violet, mealy gloss ; dorsal region curiously freckled with very fine blackish-brown curved marks which do not touch the other markings but allow them to stand out quite distinctly ; dorsal vessel visible as an indistinct paler dorsal line ; down the back from the fourth segment are transversely oval blackish-brown

blotches, which in some instances assume the form of a thick clumsy X, or a pair of curved blotches, on each segment; subdorsal and spiracular lines to be distinguished rather by the absence of the blackish-brown freckles than by any decided line of another tint; spiracles small, black, and shining; the whole body covered with very fine silky hairs of a beautiful golden-brown; undersurface paler than the back, and somewhat tinged with green.

When just hatched the young larva is of a semi-transparent purplish tint with shining brown head and the usual dots black and distinct, each emitting a long wavy whitish hair. The first food eaten is the empty egg-shell, but as soon as leaves begin to be consumed the larva becomes pale green. After a few days it changes to brown, and the hairs appear golden in the sunshine; after another moult the general colour becomes darker brown, and the transverse rows of raised dots appear to the naked eye like dark bands. When about three-fourths of an inch in length it assumes a waxy, shining appearance, with the head and collar shining black; after the next moult it is nearly black all over, but this does not last; in a day or two the skin becomes paler and of an ochreous-brown, with rather paler dorsal, subdorsal, and spiracular lines; the head dark brown; a dull dark brown plate on the second segment, and another on the tip of the anal segment; raised dots black and distinct; the oval blotches on the dorsal region visible or replaced by oblong dots; the hairs brown, very fine and silky. It is not till near full growth that the darkness of the dorsal and anal plates, and of the raised dots, disappears and the adult colouring is assumed. (Adapted from a description by the Rev. J. Hellins.)

April to June on plum, sloe, apple, knot-grass, dandelion, and apparently other trees and low plants. Mr. E. R. Banks found that larvæ, which he was feeding up upon dandelion, eagerly seized upon an opportunity of devouring dead and dried alder leaves; while Mr. W. Holland discovered that

those which were fed up to half-growth upon apple leaves, and from that to full growth upon dandelion, became full grown a month earlier than those fed wholly upon apple.

PUPA moderately stout, cylindrical, but a little depressed at the junction of the back of the thorax with the abdomen; thence rather swollen for two-thirds of the length of the abdomen, which tapers to a somewhat obtuse point, where are two hooked spines arising from a rather thickened base, and surrounded by a few short bristles; surface shining, dark purplish-brown. In a thin cocoon composed of particles of earth, lined very smoothly with silk, and having two or three threads of silk in which the anal hooks are inserted.

The moth has been found, though very rarely, sitting upon the trunks of trees in the daytime; doubtless it usually hides among the leaves. At dusk it will visit sugar, ivy-bloom in the autumn, sallow-bloom and the blossoms of plum or black-thorn in the spring, and has been known to come to light. Always a very scarce species in these Islands, and found more frequently in Devon and Somerset than elsewhere; but also taken occasionally in various localities in Surrey and Sussex; at Christchurch, the New Forest, and the Isle of Wight, Hants; the Isle of Purbeck and elsewhere in Dorset; not very rarely near Reading and elsewhere in Berks; and in Wilts, Gloucestershire, Herefordshire, Buckinghamshire, and even at Cambridge, where two were taken in the year 1873 by Dr. F. D. Wheeler. This appears to be its northern limit here. In Wales it has been found in Monmouthshire. In Ireland the late Mr. E. Birchall took it near Dublin, at Tullamore, and at Killarney; it is also recorded from Wicklow and Galway. Abroad its distribution seems to be through Central Europe and the temperate portions of Northern Europe, Northern Italy, and Corsica.

Genus 79. **CERASTIS.**

Antennæ threadlike ; eyes naked, with short front and back lashes ; thorax rather flattened, faintly crested at the back ; abdomen broad and much flattened, without crests ; fore wings horizontal when at rest, short and truncate, or very blunt, with expanded hind margin ; hind wings broad, cross-bar very faint ; vein 5 hardly perceptible except close to the hind margin.

LARVÆ elongate, cylindrical, but attenuated in front, with a well-marked dorsal plate. Feeding on trees and also on low plants.

PUPÆ subterranean.

We have three species, rather closely allied :

- A. Fore wings very broad with the apex bluntly angulated.
- B. Fore wings drab, liver-coloured, or red-brown, several black dots in the base of the reniform stigma.

C. erythrocephala.

- B². Fore wings chestnut-red, with a black or brown spot filling the base of the same stigma.

C. vaccinii.

- A². Fore wings narrower, apex pointed, hind margin retuse.

C. ligula.

1. **C. erythrocephala**, *Schiff.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{8}$ inch. Fore wings broad behind and very blunt ; pale purplish-brown rippled with purple-red, or else dark purple-red ; in the base of the reniform stigma is a cluster of dark dots ; hind wings smoky-brown with a purplish gloss.

Antennæ of the male simple but ciliated with regular tufts of fine bristles almost resembling minute pectinations, brown ; palpi short, so broadly tufted as to obscure the apical joint, purple-brown ; eyes smooth, brown, with dense black back lashes ; head tufted, pale chestnut ; thorax similar, smooth, with a faint flattened tuft at the back ; fascicles smoky-

white; abdomen broad, much flattened, pale purplish-brown; lateral tufts small but placed on a distinct ridge; anal tuft squared and very flat, dusky pale yellow. Fore wings short, broad and very blunt; costa gently rounded; apex very bluntly and squarely angulated; hind margin below it filled out and rounded, even expanded, slightly crenulated, very oblique toward the anal angle; dorsal margin slightly rounded; colour pale purple-brown, with a considerable frosting of white scales which produce an ashy-brown appearance; basal and first lines both indistinct but duplicated, the pairs widely separated, broken up into obscure purple-red crescents; second line similarly composed of a double series of very obscure crescents and waved lines; subterminal line a series of cloudy purple-brown dots, preceded on the costal margin near the apex by a similar triangular spot; orbicular stigma only indicated by the lower half of a slender red margin; reniform stigma also visible by its red margin, but open on its upper side, and having its lower portion occupied by three or four red-black dots of different sizes; cilia pale purple-brown with a rather darker undulating line along the base. Hind wings rather broad; hind margin a little hollowed below the apex; smoky-brown with darker nervures; cilia pale brown tipped with white. Female accurately similar, but with the body a little stouter.

Underside of the fore wings purplish-drab; the middle area occupied by a smoky cloud in which is a suggestion of a darker reniform stigma; beyond this is a smoky transverse line. Hind wings smoky-white dusted along the costal area with purple-brown; central spot large, lunate, smoky-black; toward the hind margin is a slender undulating smoky-black transverse line. Body and legs purplish-brown.

There is a well-known recurrent variety—var. *glabra*—in which the pale purplish-brown ground colour is replaced by deep glossy rich purple-brown or dark chestnut-brown, but with the stigmata and an incomplete submarginal stripe ashy-brown or ashy-white, and the lines faintly similar. This is

a very different-looking insect from the type and decidedly more rare. It occasionally varies more in the direction of purplish-umbræous.

On the wing in October and November. In its usual haunts it hibernates and reappears in the spring, but I find no record of such an occurrence with us.

LARVA paler or darker brown-grey or yellow-brown with three slender paler dorsal lines, of which the two sub-dorsal are often invisible; raised dots on the dorsal region white; spiracles black; undersurface pale grey; dorsal plate pale brown or black with two white or yellow lateral streaks; anal plate similar; head black-brown. (Hofmann.)

June and July on low plants; but Rössler fed the young larvæ at first on oak leaves, later upon snowberry and herbaceous plants, and it is not improbable that, as in some other species, the leaves of trees are at first preferred, but afterwards forsaken for low-growing plants.

PUPA red-brown, in a thick cocoon in the earth. Not further described.

Very little is known here of the habits of this extremely rare moth, but it has been taken at ivy-bloom, at sugar and once at a gas lamp. The first specimen known to have occurred in this country was secured in November 1847, near Brighton, by Mr. H. Cooke; this proved to be of the var. *glabra*. In 1858 he met with a second, and one was taken by the Rev. J. Image, both in the same neighbourhood. In the meantime, in 1856, a specimen also of the var. *glabra* had been taken near Plymouth by Mr. J. J. Reading; and soon after (1859) one was secured near Marlow by Mr. A. H. Clarke. Mr. S. Stevens, one of our oldest entomologists, still active, and always willing to help me in this work, says: "I have a fine series which I obtained from time to time, taken under the South Downs between Brighton and Eastbourne, and again inland between Dover and Canterbury."

There are also records of captures at Wells, Weston-super-Mare, Somerset, and one at St. Albans. After this the insect seems to have disappeared for some years, but in 1872 and 1873 both forms were taken near Lewes by Mr. J. H. A. Jenner, and one at Darenth Wood, Kent; and it is said to have been obtained more recently in the New Forest. Yet it must again have very nearly disappeared for twenty years, until in 1894 a single specimen was secured in Devon. These are all the instances of its occurrence in these Islands of which I have any knowledge, and are restricted to the counties of Sussex, Kent, Hants, Bucks, Herts, Somerset, and Devon. Abroad it appears to be local, confined to Central Europe and Northern Italy, but in some districts is said to be plentiful.

2. **C. vaccinii**, L.—Expanse $1\frac{1}{8}$ to $1\frac{3}{8}$ inch. Fore wings short, broad, with very blunt apex; chestnut-brown marbled and rippled with red or purple-red; base of the reniform stigma usually filled by a black or brown-black spot; hind wings black-brown, often shaded with red; cilia light purple-red.

Antennae of the male stout, simple, minutely ciliated, red-brown; palpi short, densely tufted, purple-red, apical tuft obscure; eyes naked, reticulated, black, lashes also black; head densely tufted, bright chocolate-red; thorax broad, rather flattened, similar in colour but more purple-red at the back, where also is a flat tuft; fascicles pale brown, tinged with purple-red; abdomen much flattened and dilated behind, purplish-red, clouded at the base with long paler hair-scales; lateral tufts conspicuous, upon a broad ridge; anal tuft rather short and squared, both orange-red. Fore wings short, broad, excessively blunt; costa nearly straight; apex obtusely angulated; hind margin below it sloping *outward* and much expanded, faintly crenulated and curved back to the anal angle; dorsal margin a little rounded; colour pale chestnut, chestnut-brown, or dark tawny, clouded

and rippled with purple-red; basal region to the first line of the latter colour, the line itself double, placed in broad curves, dark red-brown; second line of unusual form, the portions toward the margins of the wing being placed opposite each other, waved and scalloped, while the middle portion is curved out toward the hind margin, sometimes very strikingly so; outside it on the costa is a large purple-brown cloud, cut off before the apex; subterminal line a partial row of black dots, which is followed by a more complete row of clouded black streaks; orbicular stigma large, extended so as almost to reach the costa, but only indicated by its rust-red margin; reniform stigma also large and broad, similarly indicated, but its lower area occupied by a dull black spot; between these is a deeper purple-red blotch extending as a curved line or central shade to the dorsal margin; costa toward the apex dotted with pale brown; cilia chestnut-red clouded with purple-red. Hind wings rather small, with the hind margin sinuous, smoky-brown or smoky-black, sometimes tinged in its middle portion with purple, and in that case showing a slender angulated central transverse line; cilia long, purplish-red, shading to paler at the tips. Female quite similar, or with the hind wings more clouded with smoky-brown or smoky-purple; abdomen rather thicker.

Underside of the fore wings pale chestnut, with smoky clouding toward the base and dorsal margin; beyond the middle is a slender undulating darker transverse stripe, followed by another rather more direct, though curved. Hind wings pale purple, dusted with brown and broadly clouded and dusted with chestnut toward the costal area; central spot a small black-brown crescent; beyond it is a slender undulating purple-brown transverse stripe. Body and legs dark purple-brown.

Variable in the depth of the ground colour and in the degree of marbling or rippling of purple-brown; often this darker colour suffuses the whole surface except the hind margin, and the fore wings become of a very smooth uniform

dark purple-brown; or the whole is of an equally smooth chestnut-red; or it is ornamented with short white lines upon the nervures. When this last character is added to the usual typical form the variety seems to be called var. *mixta*; when to the very dark form. var. *spallica*; but these names are somewhat arbitrary, all the variations being inextricably intermingled. In the collection of Mr. S. J. Capper is a curious specimen of an unusually bright red-brown, shading off to drab. It was reared at Rotherham, Yorks. The darkest purple-brown form, with the hind margin normal, is usually a Western variety, from South Wales especially, but it has once been taken at Droitwich, Cheshire, by Mr. G. W. Wynn.

On the wing from September till November, and after hibernation in March and April.

LARVA elongate, velvety, attenuated in front; head small, rounded, shining reddish-brown dusted with dark brown; on the second segment is a horny plate of a dark reddish-brown with three white lines; general colour purplish-red or reddish-chocolate with a greenish tinge, and faintly irrorated with a paler shade of the ground colour; dorsal and subdorsal lines only just perceptibly paler, the former often interrupted with grey at the incisions; spiracles black, distinct; undersurface and sides below the spiracles dull pale green; usual raised dots whitish or pale grey, most distinct on the sides. (C. Fenn.) Dr. Chapman points out that the dividing-line between the colours of the upper and under surfaces, where it exists, is waved or zigzag, and the difference really is only one of intensity of colour, in the most part without any real dividing-line. The area above this is dark, and it is by these characters more particularly that the larva of this species is to be distinguished from the very similar larva of the following. When quite young it is of a delicate semi-translucent appearance, of a pale flesh tint with very few markings.

May and June on oak, elm, willow—even feeding in the catkins—and on knot-grass and other low-growing plants; while upon the trees it conceals itself between leaves during

the day, when upon low plants underneath their leaves, feeding always at night.

PUPA elongate, shining ; wing and antenna-cases projecting very slightly over the abdomen ; anal extremity blunt, with a minute bristle ; colour bright mahogany or orange, the incisions, dorsal shade, and anal segment darker brown ; spiracles small, black. In a thick silken cocoon on or immediately under the surface of the ground. (C. Fenn.)

The moth hides in the daytime among dead leaves and herbage upon the ground. At dusk it comes most eagerly to sugar and remains upon it, indifferent to the light of a lantern, until satiated, when it crawls lazily away and may be seen hanging to a twig anywhere about the trunk and main branches of the tree. It comes with equal zeal and determination to ivy-bloom, over-ripe blackberries, rotten apples, and almost any sweet substance, in the autumn ; and during the winter will crawl out of its hiding-place on any warm evening to look for food, becoming exceedingly worn in this process. An entomologist who has sugared for experiment through the winter has found this species feeding on every mild night, and has even seen the same marked individuals night after night. In the spring it resorts to sallow-bloom and the blossoms of blackthorn and plum, and it is at this season that pairing takes place and eggs are deposited.

Everywhere abundant in woods and well-timbered districts, and to be found almost all over England, Wales, and Ireland, and almost all Scotland, with the exception of the Isles, and apparently of the more western districts north of the Clyde Valley. Abroad its range extends throughout Central Europe and the temperate portions of Northern Europe, Northern Italy, Southern Russia, Armenia, and the mountainous regions of Central Asia.

3. *C. ligula*, *Esp.* ; *spadicea*, *Stainton, Newman* ; *sub-nigra*, *Haw.*—Expanse $1\frac{1}{2}$ to $1\frac{1}{4}$ inch. Fore wings short but not very broad, retuse behind, with the apex decidedly

pointed; dark red-brown or purple-brown, sometimes marbled or banded behind with paler. Hind wings black-brown, with pale purple cilia.

Antennæ of the male simple, cylindrical, minutely ciliated, red-brown; palpi short, excessively tufted, dark purple-brown; eyes leaden-black, their lashes dark brown; head strongly tufted, dark purple-brown, dusted with white; thorax similar, smooth, minutely and flatly tufted at the back; fascicles pale smoke colour, tinged with purple; abdomen flattened and dilated, purple-brown dusted with black; lateral and anal tufts widely flattened. Fore wings not very broad, even in width; costa very nearly straight; apex rather squarely yet sharply angulated; hind margin beneath it straight or faintly hollowed, filled out in the middle, and below this crenulated and rounded off; dorsal margin faintly rounded; colour deep dark purplish-chestnut or purple-red, varying to red-black; surface glossy, markings hardly perceptible except by the aid of a lens; basal line arising from a white dot on the costa, obscurely angulated and edged with black; first line also from a white costal dot but only perceptible as an angulated red shade edged with purple-brown; second line hardly more distinct, much angulated but erect and bent outward in the middle, red-brown; subterminal line sometimes visible as a row of small red-brown dots in a stripe of paler ground colour which often precedes the hind margin; costa beyond the middle dotted with minute oblique white streaks; cilia purple-brown, dotted with pale red, and having an orange-yellow faint line along their base. Hind wings rather small, with a sinuous hind margin; colour smoky-black with a purple-red gloss; cilia orange-red shot and tipped with white. Female hardly distinguishable.

Underside of the fore wings smoky-black with the costal and broad hind-marginal regions purple-red dusted with black. Hind wings smoky-white, dusted with black and broadly clouded along the costal region with purple-red; central

spot obscure, blackish; halfway between it and the hind margin is a slender sinuous straight smoky-black stripe; cilia purple-red. Body and legs dark purple-red; tibiae banded with white.

Rather variable in colour, varying from reddish-chestnut to deep dark purplish-brown or black-brown, sometimes with a pale stripe before the hind margin; this in the redder forms is light chestnut, but in those of the darkest colour occasionally greyish-drab and conspicuous. These striped forms seem to be almost confined to the west, and are most frequent in Wales. Probably this is the supposed species called *subnigra* by Haworth, Curtis, and Wood. In the collection of Mr. W. H. B. Fletcher is a series of the present species of unusually large size, many specimens having the fore wings more than usually broad and the hind margin rather increasingly expanded yet angulated, and the apex pointed.

On the wing in October and November, and in mild weather through the greater part of the winter, but hardly ever living till the spring. I have only a single record of the occurrence of this species in April.

LARVA rather velvety, attenuated in front; head small, rounded, shining reddish-brown dusted with dark brown; dorsal plate also reddish-brown or black-brown, with three white lines; body chocolate-red or red-brown faintly marbled with a paler shade of the same; dorsal and subdorsal lines obscurely paler, the latter often shaded with darker colour below, or even forming a dark olive-brown lateral stripe; spiracular stripe broad, straight, and distinct, reddish-orange; spiracles ringed with black; ventral surface paler chocolate-brown. Very similar to the preceding, but recognisable by the bright spiracular stripe.

April to June on hawthorn, oak, willow—sometimes in the catkins—plum, honeysuckle; and when older on low-growing plants such as chickweed.

PUPA apparently undescribed.

This species has the singular habit of depositing its eggs in midwinter, so that its larvæ hatch out about three weeks earlier than those of *C. vaccinii*; the moth, however, usually emerges from pupa a week or two later than that species. It hides in the daytime in the same manner among leaves, usually upon the ground, and comes at dusk with equal readiness to sugar, ivy-bloom, over-ripe blackberries, rotten apples, and other sweets, and may be similarly attracted in mild weather in the winter, but seems usually to perish before the spring. Partial to lanes and hedges as well as woods, and often to be found on the small bunches of blooming ivy in the hedges. More local than the last species and usually much less common, yet far from rare in the Southern and Eastern Counties and throughout the west and south-west; also to be found in suitable places throughout England, even to Cumberland and Northumberland; yet, so far as I know, not recognised in Scotland. This must, I think, arise from its having occasionally been confounded with *C. vaccinii*, and not from total absence, though Dr. Buchanan White says that of its presence in that country there is no satisfactory evidence. In Wales it is moderately common, to Pembrokeshire; in Ireland always rare, but has been noticed in Kerry, Tyrone, Cavan, and Antrim, and at Enniskillen. Abroad, if not overlooked or confounded with the previous species, its range is not very wide, being confined to Central Europe, the South of France, and Spain.

Genus 80. SCOPELOSOMA.

Antennæ threadlike; eyes naked, with strong front and back lashes; thorax squared and having a distinct narrow top crest; abdomen much flattened and without crests; fore wings long, even in width, hind margin decidedly scalloped; hind wings broad, with crenulated hind margin; vein 5 hardly perceptible.

We have but one species.

1. **S. satellitia**, L.—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings elongated, the hind margin expanded and scalloped; rich chestnut-red marbled with darker; the lines black; reniform stigma white or yellow with a similar dot above and below. Hind wings smoky-black.

Antennæ of the male thick, simple, minutely ciliated, red-brown, whiter at the base; palpi short, broadly and densely tufted; eyes shining black, lashes at front and back curled over, brown-black; head thickly tufted, pale chestnut dusted on the top with white; collar of the same colour, with a dusting of white toward the back; thorax broad, squared, and smooth, except that between the two halves of the collar arises a tall narrow crest or tuft, erect and almost conical, chestnut-brown, as is the rest of the thorax; fascicles smoky-white; abdomen pale smoky-brown, flattened, and much dilated behind; lateral tufts broad, anal tufts rather narrow, very flat, all pale tawny. Fore wings elongated, blunt; costa a little arched at the base and also close to the tip, but otherwise almost straight; apex angulated; hind margin rounded but expanded below the apex, and very neatly and beautifully scalloped or crenulated throughout; dorsal margin nearly straight; colour rich bright chestnut; lines obscure, the basal being a slender partial purple-red streak, edged outwardly with paler; first line erect, slender, nearly straight, purple-red; second line also erect and but little angulated or bent, leaden-black with a faint clouding of the same on the nervures on each side; subterminal line a faint, rippled, cloudy pale chestnut thread, in a large, rather ovate, deep chestnut band, which fills the hind marginal space; orbicular stigma hardly perceptible, or, if visible, only as a pair of small round paler clouds; reniform stigma the only conspicuous marking on the wing, short, lunate, pure white or orange-yellow, with a similar dot each at its upper and lower corners (a sort of half moon with two satellites, whence its name), costa beyond the middle faintly dotted with yellow; extreme hind margin exquisitely edged by a rich red crescent

in each scallop, enclosing a yellow dot; cilia following the undulations of the margin, rich chestnut shaded with purple-brown. Hind wings not large, the hind margin sinuated; dull smoky-brown, almost smoky-grey, paler in front, nervures rather darker; cilia brownish-white. Female so similar as to be rather difficult to distinguish.

Underside of the fore wings pale yellowish-brown dusted with black and having a large smoky-black central cloud which is thickly clothed with long hair-scales; reniform stigma rather blacker, and edged outside with a white dot; beyond this is a slender smoky-black transverse stripe. Hind wings dusky brownish-white, heavily dusted with dark brown; central spot lunate, smoky-black; beyond it is a fairly straight but sinuous smoky-brown transverse line. Body and legs purplish-brown.

Not very variable beyond the constant alternation of the reniform stigma and its attendant dots between pure white, and deep yellow, orange, or even chestnut—in which last case these markings also are very obscure—but in Yorkshire specimens are obtained which are much suffused with black-brown, or even black, and others dull brown with very little of the usual chestnut colouring. Scotch specimens are rather richly coloured, and one in the cabinet of Mr. Sydney Webb is of a wonderful crimson-red, especially crimson toward the base.

On the wing in September, October, November, and whenever the temperature is mild, in the winter, becoming very much more scarce toward the spring, yet found occasionally in March and April.

LARVA nearly cylindrical but with the anterior segments tapering; head narrow, rounded above, clear bright brown on the crown, black-brown about the mouth; colour of the body rich velvety brown; the second segment has three longitudinal lines on the back of a paler colour, and of these the middle one is less distinctly pronounced than the other

two; these appear like the anterior extremities of dorsal and subdorsal stripes, the remaining portion of which in most specimens has been obliterated, but which in some are slightly indicated throughout the entire length of the body; on a line with the spiracles is, between the second and third, and again between the third and fourth segments, a somewhat linear but inconstant snow-white spot, a linear white spot on the fifth and another on the eleventh segment; these seem like broken portions of a spiracular line, which is very evident in some specimens, but scarcely perceptible in others; ventral surface, legs, and prolegs paler and less velvety than the dorsal surface; legs variegated with black. (Newman.)

May and June on oak, sloe, maple, willow, the seeds and leaves of wych-elm and of primrose, various low-growing plants, and the larvæ of its own and especially of other species. This last depraved habit, however, does not seem to be universal. Dr. Chapman, when expressly experimenting upon this habit, could not induce his larvæ to destroy their fellow-captives; he even confined several larvæ in a small tumbler and stinted their supply of vegetable food without provoking them to do each other any injury. On the other hand, Mr. Newman relates how he lost a brood of fifty-seven larvæ of *Taniocampa populeti*, all of which were devoured by a single larva of the present species accidentally introduced with fresh food. Those also which he intentionally reared for description refused oak-leaves and feasted on larvæ of the common winter-moth (*Cheimatobia brumata*) and others. This habit is indeed so well established that German entomologists know this larva as "Mordraupe" (murder-caterpillar). In other respects it seems to be arbitrary in its tastes, since it sometimes leaves trees when well grown to feed on low-growing plants, yet has been known, when feeding upon primrose, to leave it and eagerly devour the leaves of wych-elm. When young it is said to draw together the leaves of the tree it inhabits and hide between them.

PUPA yellow-brown ; in a slight cocoon in the earth. Not more particularly described.

The moth has the habits of the previous species, and is rarely seen in the daytime. At dusk it comes eagerly to sugar, ivy-bloom, ripe blackberries, and rotten apples ; and occasionally to light. It will move about and sometimes feed on any mild night throughout the winter ; pairs very early in the spring, and lays its eggs in March. From this time it is scarce and hardly notices the fallow-bloom, though such individuals as are about will still come to sugar. Most plentiful in woods, but generally distributed throughout England, except perhaps the western half of Cornwall, and in most districts abundant, the present Fen districts and some portions of the Midlands forming in some degree an exception. Common also in both North and South Wales, and throughout the South and East of Scotland, also in West Ross, and has been taken by Mr. Cheesman at Stromness, Orkney. Found all over Ireland, and usually common in that country. Abroad it ranges through Central, and the temperate portions of Northern, Europe, Northern Italy, Southern Russia, and the mountainous regions of Central Asia. In North America is a variable species called *S. sidus*, Gn., which may possibly be no more than a local race of the present.

Genus 81. **XYLINA.**

Antennæ ciliated, sometimes tufted at the base and clothed with scales which taper off ; eyes naked, with lashes in front and at the back, the latter curled ; head furnished with projecting tufts ; thorax square, shouldered, crested at the top and back ; abdomen slightly flattened, usually with three to five small crests or tufts. Fore wings long and narrow, with the apex blunt and the anal angle rather excavated. Hind wings small : crossbar faint ; vein 5 from below its middle.

LARVÆ cylindrical, smooth, naked, with distinct lines; feeding upon trees.

PUPÆ subterranean.

We have five species, not difficult to distinguish.

A. Fore wings white mottled with grey, a black streak from the base. *X. rhizolitha.*

A². Fore wings brown.

B. Thorax dark umbreous. *X. semibrunnea.*

B². Thorax pale brown. *X. petrificata.*

A³. Fore wings slate-coloured or black.

C. First line of the fore wings angulated but perpendicular. *X. conformis.*

C². First line angulated but oblique and bent. *X. lambda.*

1. **X. semibrunnea**, *Haw.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Thorax squared, with the shoulders prominent, dark umbreous. Fore wings very narrow, hardly broader behind, pale umbreous, blackened along the dorsal half; near the middle of the dorsal margin is a curved paler streak, and at the anal angle another; hind wings brownish-white.

Antennæ of the male simple, minutely ciliated, dark brown; palpi broadly tufted, reddish-brown, apical joint long, blunt, and porrected; eyes naked, reticulated, black; lashes curled over them, black-brown; head prominently tufted in two pairs of projecting pointed tufts, umbreous tipped with darker; thorax squared, the outer edges of the shoulder-lappets raised into a sort of epaulet, purplish-umbreous, rather paler in front; top crest narrow, pushed forward, and faintly divided, back crest small and rather flattened, both black-brown; fascicles brownish-white; abdomen slightly flattened or dilated, light purplish-brown; having the dorsal ridge ornamented with six crests, black, and all small except the third, which is tall and conspicuous; lateral tufts small, placed on a dilated ridge; anal tuft compressed and rather squared. Fore wings long, narrow

throughout; costa very nearly straight; apex bluntly angulated; hind margin oblique, curved, strongly crenulated, and excavated at the anal angle; dorsal margin very faintly hollowed; colour pale umbreous dusted with black, and the dorsal half of the wing strongly shaded with the same, the nervures in particular lined or dotted with black; an elongated black streak precedes the anal angle; usual markings only fragmentary and hardly perceptible, but between the dorsal margin and the median nervure are faintly paler angulated streaks representing the first line, and a curved pale streak in the usual place of the second line, which, however, is more fully suggested by a curved series of single or double brown dots in the paler costal region; beyond these are several dark brown wedges, and close to the hind margin some black streaks pointing inward between the nervures; these last streaks are edged with pale brown in such a manner as to produce a slightly zigzag effect along the hind margin; upper stigmata faintly perceptible as paler unmarginated clouds, the orbicular flattened and oblique, the reniform shortened; cilia deeply scalloped, pale umbreous with an undulating dark brown intersecting line. Hind wings rather short and small with very sinuous hind margin; smoky yellowish-white, darkened toward the hind margin, and with the nervures brown; cilia crenulated, pale purplish-brown. Female extremely similar, but with a smaller anal tuft.

Underside of the fore wings very pale brown dusted with darker, and clouded in the middle with smoke-colour; discal cell filled with long prostrate hair-scales; reniform stigma indicated by a black spot; cilia dark brown. Hind wings yellowish-white dusted with purple-brown, especially so toward the costa and apex; central spot conspicuous, lunate, smoky-black; cilia purplish-white. Body and legs pale purple-brown.

Very constant in colour and clouding and in the deficiency of markings.

On the wing in September, October, and sometimes November; more rarely, after hybernation, in March and April.

LARVA cylindrical but tapering slightly from the fourth segment to the head, which is full and rounded, pale bluish-green faintly reticulated with darker; body tapering a little behind, delicate pale and bright yellow-green; dorsal stripe broad and very distinct, whitish-yellow, rather narrower at each extremity; subdorsal line well defined only on the second segment, as is also the beginning of a faint line below it; on the remainder of the body these are very thin and faint, composed of a series of short whitish streaks much interrupted; the remainder of the dorsal ground colour, except the dorsal and anal plates, very finely freckled with yellowish atoms; raised dots whitish-yellow, each set in a green ring; spiracles oval, white, delicately outlined with black; along them the green colouring is a little deepened; below is a broad sulphur-yellow stripe, extending down the front of the anal prolegs; ventral surface similar in colour to the back; prolegs of the same colour, provided with very sharp hooks. A day or two before retiring to the earth it becomes suffused with brown, deepening at the last to purplish-brown.

When just out of the egg it is of a pellucid yellowish-green with a faint opaque yellowish-white dorsal line; a few days later the subdorsal lines begin to appear, and in a fortnight these have become more distinct. (Adapted from Buckler.)

May to the end of June or beginning of July on the leaves of ash, remaining upon the tree and clinging tenaciously to the leaves or leaf-stalks; but when full-fed leaving the tree to spin up in the ground.

PUPA red-brown, apparently undescribed.

The moth seems never to be observed at large in the

daytime; probably it rests in trees. Its resemblance, when quiescent, with its wings folded straight down, almost rolled round its body, and coloured with different shades of umbreous and black, to a bit of stick, is so close that it would almost certainly pass unobserved. At night it frequents ivy-bloom, and will come to sugar; it has also, though rarely, been taken at sallow-bloom in the spring. A local species, and usually scarce. To all appearance attached more especially to chalky districts, and is more frequent in the West of England than elsewhere. It has been found as near to London as Lewisham, and elsewhere in Kent at Charlton, Darenth, Dover, and Sheerness; in Surrey, very rarely, at Guildford, Mickleham, and Hampton Court; also in Sussex, Dorset, the south coast of Devon, Somerset, Wilts, Berks, Bucks, Oxfordshire, Middlesex; St. Ives, Hunts; Whittlesford, Cambs; Suffolk, Gloucestershire, Herefordshire, Worcestershire, and even Cumberland. There is a record of its capture, commonly, at Laugharne, Carmarthenshire, which record, had it been of its capture *rarely*, might have been accepted, but I confess to a strong suspicion that the species there taken was *X. petrificata*, in the darker variety known in Wales. It does not appear to have been seen in Scotland. In Ireland Mr. Kane records it as found in Galway and rather commonly in Kerry. Abroad its range is through Central and Western Europe, Southern France, and Austria.

2. **X. petrificata**, *Schiff.*; **socia**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings narrow, contracted behind; brownish-buff clouded a little with rust-red and sometimes with black; in the middle is a whitish dot and below it a short similar curved streak. Hind wings pale brown with a purple flush.

Antennæ simple, ciliated, dark brown, but toward the under portion of the base clothed with white scales; palpi broadly tufted, whitish-brown shaded outside with dark umbreous; apical joint prominent but blunt; eyes naked,

reticulated, black, the lashes black and also curled; head densely covered with scales, which take the form of prominent pointed tufts, whitish-brown; collar erect or even curved forward in a strong ridge in the middle, whitish-brown slenderly barred with umbreous; rest of thorax of the same colour, with a few scattered black dots on each side; top crest ridged, divided, thrusting the collar forward; back crest small and flattened; shoulders squared, the outer edges of the lappets being prominent; fascicles abundant, long and curved, white; abdomen pale brown, with a distinct erect black crest on the dorsal ridge of its third segment, and sometimes a smaller one on the following, or black-brown spots on the remainder; lateral tufts small; anal tuft squared and tinged with yellow. Fore wings narrow throughout; costa faintly curved; apex bluntly squared; hind margin elbowed, crenulated, a little contracted; dorsal margin unusually straight; colour pale brownish-drab or brownish-buff, tinged along the dorsal half with rusty-brown or occasionally with blackish clouding; nervures shaded or dotted with red-brown; markings absent or hardly perceptible, when present pairs of brown dots on the subdorsal and median nervures are connected by long, slender, deeply angulated streaks, forming an obscure first line, while the second line is rather more clearly indicated in a curved series of pairs of black-brown dots; beyond this is a series of small wedge-shaped fulvous clouds, and along the hind margin another series intermingled with short black-brown streaks; orbicular and reniform stigmata suggested by pale unmarginated clouds, between which, and below, is a partial central cloud of reddish-umbreous above and blacker below, edged as to its lower portion by a pale drab spot; costa faintly dotted with small dark and pale cloudy spots; cilia yellowish-drab dashed with fulvous. Hind wings rather ample; flatly rounded behind but hollowed below the apex; smoky-brown shading paler to the base and shining with a golden or purple gloss; cilia brownish-white. Female accurately similar.

Underside of the fore wings pale drab, slightly clouded with smoky-black and with a small black spot at the reniform stigma. Hind wings yellowish-white dusted with brown, and shaded with the same toward the apex; central spot small, smoky-black, followed by a slender brown transverse shade. Body and legs pale drab.

Not very variable, but in western districts, and especially in South Wales, the dorsal half of the fore wings in some specimens, or even the whole surface, is more than usually clouded with rusty-red mixed with black, and the usual small central cloud is increased in size and blackened, sometimes spreading into a broad ill-defined leaden-black patch over the dorsal margin. In such examples the pale clouds representing the stigmata are rather more distinct. A much more red form has been taken at Enniskillen, Ireland, by Colonel Partridge. But the most remarkable aberration known to me is in the collection of Mr. Sydney Webb; in it the surface of the fore and hind wings is dappled over with brownish-white, partially in rings, as though the usual colour had been semi-fluid and had been rained upon!

It may be well to observe that, although the darker western forms of this species seem to approach more nearly in colouring to *X. semibrunnea*, they are never of the *umbræous* ground colour of that species, nor are the fore wings ever so narrow as in it.

On the wing from September till the beginning of November, and, after hybernation, from February till April or the beginning of May.

LARVA nearly uniformly cylindrical, with the segmental divisions conspicuous; head smooth and globular, quite as broad as the second segment, pale green variegated with white; skin soft, rather pulpy to the touch; the usual spots small but distinct; general colour pale green, appearing as though powdered with white; dorsal line a broad clear white stripe; subdorsal lines also white but narrower; spiracular

lines narrow, yellow; there is also a faint dotted white line between the subdorsal and spiracular; spiracles indistinct, white encircled with black; legs green, tipped with shining black; undersurface and prolegs of a uniform dull green. (G. T. Porritt.)

May to July on oak, saw, ash, lime, birch, apple, bramble, plum, and lilac, and often as it gets towards full growth it leaves the trees to feed upon low-growing plants. If not supplied at this time with sufficiently succulent food, in confinement, it falls upon and devours other individuals of its own species.

PUPA smooth, shining brown, with two diverging spikes on its tail. In a close earthen cocoon. Not more fully described.

It is uncertain where the moth hides in the daytime in autumn; in the spring, after hybernation, I have found it sitting upon a tree-trunk, and also hiding under thatch on outhouses. At dusk it comes readily in the autumn to ivy-bloom, sugar, ripe blackberries, yew-berries, and even rotten apples, and in the spring to saw-bloom. Sometimes at this season it becomes extremely bleached; yet it is not until the spring that it pairs and deposits its eggs. Not by any means so scarce as the last species, yet hardly so widely distributed, since it seems to be quite absent from the East of England. It has, however, been taken in Middlesex and Surrey, also in Sussex, the Isle of Wight, and Dorset; rarely in Cornwall; more frequently in Devon, Somerset, Gloucestershire, Herefordshire, and Worcestershire; rarely in Cambridgeshire and even in Cumberland, and there is a single record of a specimen near Liverpool. It must, I think, be frequent in Wales, since I found it far from rarely in Pembrokeshire, and have no doubt that the *X. semibrunnea* recorded as common at Langharne, Carmarthenshire, was really this species. I know of no instance of its occurrence in Scotland, but in Ireland it has a wide range, having been

taken at Dublin—even so close to the city as Glasnevin Cemetery—in Wicklow, Waterford, Cork, Kerry, Westmeath, Mayo; Tullamore abundantly; Galway, Sligo, Fermanagh, Cavan, and Louth, and often commonly.

Abroad it is found throughout Central Europe and the temperate portions of Northern Europe, Northern Italy, Southern Russia, and the mountainous regions of Central Asia.

3. **X. conformis**, *Schiff.*; **furcifera**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings narrow, but little broader behind, blunt, grey-black marbled with deep black; a yellow streak at the base, an orange spot in the reniform stigma, and a row of red-black spots before the hind margin. Hind wings reddish-white shading off to smoky-black.

Antennæ of the male thick, minutely notched and delicately ciliated, black-brown; palpi short, very broadly tufted, purple-black; apical joint short; eyes black, with black lashes, which are long and so curled as almost to meet; head densely and prominently tufted, in two pairs of projecting points, purple-black; thorax squared, with distinctly raised and projecting epaulets at the shoulders; collar dark purple-brown, edged slenderly with white, pushed forward in the middle by a tall, conical, but slightly divided, purple-black crest; remainder of thorax deep black; back crest short and divided; fascicles pale smoky-brown; abdomen short and broad, purple-brown; third segment decorated with a large conspicuous black dorsal crest, and the following segment with a more prostrate brown one; lateral tufts rather spreading; anal tufts short, flat, and squared. Fore wings rather long and narrow, but a little broader behind; costa arched; apex bluntly angulated; hind margin full and rounded, crenulated, and close to the anal angle slightly hollowed; dorsal margin very slightly concave; deep rich shining slate-black; from the base arises a deep black streak, forked at a short distance, edged on its upper side by a

slender streak of light orange-yellow; beneath it at the base of the dorsal margin is a shaded red cloud; first line deep black, slender, sinuous, indented, but nearly perpendicular; second line similar, not very oblique but much indented; subterminal line a row of cloudy red-black spots not attaining either margin; orbicular stigma of the ground colour, partially but obscurely edged with deep black; reniform stigma extremely large, sharply edged at the back and below with deep black, the remainder slenderly and faintly margined; within it is a large, somewhat lunate orange-red cloud; claviform stigma outlined with black; from it a straight, thick, deep black bar passes to the second line; the space between the upper stigmata is triangular and deep black, the costal margin above it being clouded with the same; cilia of the ground colour, dashed with deep black. Hind wings not very large, the hind margin sinuous and somewhat excavated below the apex, smoky-white with a reddish flush at the base, shading off to smoky-black behind; nervures and hind margin dark brown; cilia brownish-white, whiter at the tips. Female accurately similar.

Underside of the fore wings pale purple-brown, shading to paler in the middle and to pearly-white along the dorsal margin; discal cell filled with long prostrate hair-scales; reniform stigma indicated by a large black spot. Hind wings dusky-white, abundantly suffused and dusted with purple-brown; central spot large and black; beyond it is a curved irregular smoky-black transverse stripe. Body and legs deep purple-brown.

Hardly ever varying here, but in the collection of the late Mr. F. Bond is a specimen of a paler slate-grey. On the Continent the general tendency appears to be to rather larger size and a more dull and paler slate-grey colouring, with a darker central shade, and the red of the reniform stigma intensified.

On the wing in September and October, though reared specimens sometimes emerge in August; it hibernates, and

appears again in March and April, in its very restricted localities.

LARVA rather stout, cylindrical, except that the head is a little narrower than the second segment, which, with the third, tapers slightly forward, and that the thirteenth is tapered to the end; head full and rounded at the sides, olive-brown, freckled and reticulated with darker brown; second segment slightly more shining, adorned on the back with two pairs of yellow spots, raised dots all pale yellow, distinct, ringed with black; skin smooth and velvety, olive-brown tinged with green, more particularly on the back; sides and ventral surface rather paler and tinged with pink; dorsal stripe pale yellow, interrupted by a deep blackish freckled patch of the ground colour at the beginning of each segment, which by extension backward on either side forms the boundary of more than one-half of a blunt diamond of blackish freckles, the area within showing the yellow dorsal stripe but faintly; this dark freckling with a deeper suffusion of ground colour forms a line across the back from the hinder raised yellow dot on one side to that on the other; the rest of the diamond is but faintly freckled, and there, at the end of each segment, the dorsal stripe is bright and unclouded; subdorsal stripe pale yellow; into it from the hinder raised yellow dot on each segment runs an oblique thick black streak extinguishing it nearly to the segmental division, or in some instances opens a little at one or at each end, so as to allow the yellow stripe to appear; below on the side is a fine wavy yellowish line, its edges roughened by black atoms; spiracular line thin, yellow, the area above it much freckled with deeper olive-brown; spiracles oval, dirty-white, ringed with black; undersurface and legs paler, and tinged with olive-pink; prolegs freckled with yellow and olive, and tipped with pinkish-brown.

The young larva when just hatched is semi-translucent, pale drab, with a green internal dorsal stripe; when a fort-

night old, pellucid green with distinct whitish longitudinal lines; a week later full bright green with the lines whitish-yellow; and at a month old rich full velvety-green with the lines and raised dots bright sulphur-yellow—the colouring being now at its brightest; afterwards the colour of the body becomes olive-brown, and the adult appearance is soon assumed. (Adapted from Buckler.)

April to June on alder (*Alnus glutinosa*). For the first three weeks of its life it lives and feeds within the hollows between the ribs of the partially expanded young alder-leaves, afterwards apparently feeding more openly.

PUPA rather thick in proportion; the thorax, wing, leg, and antenna cases finely corrugated, and the abdominal segments rather smooth, terminating in a hooked point by which it is firmly attached to one end of the cocoon; colour dark brown; incisions of the segments brownish-red and the whole surface shining. In an oval cocoon of whitish silk, close but semi-transparent; placed in moss or a folded leaf, or between a fallen leaf and the soil. (Buckler.)

But little is known of the habits of the moth in this country. It has been taken in the daytime, once, sitting upon a birch-trunk, but almost all the captures have been at night at sugar or ivy-bloom, to which it is strongly attracted. The first record of its appearance in this country seems to be in a short note by the late Mr. H. T. Stainton in 1861: "In the county of Glamorgan *Xylina conformis* occurs; it comes to ivy-bloom in October and to sugar in March." Not a word is furnished as to the name of the captor, the date of first capture, or the actual locality; but two specimens were exhibited at a meeting of the Entomological Society of London in March 1861. Some years later Mr. T. H. Allis put on record the occurrence of a single specimen taken near Halifax, Yorks, many years before. In 1869 it appears to have been taken in Monmouthshire; and also reared from eggs obtained presumably in the Glamorganshire locality,

where, though the same reticence has been observed, there is little doubt that it has been taken nearly every season up to the present time. Doubtless its home is on the hillsides in South Wales where the alder trees and bushes grow in every damp spot and border every rivulet. Outside the two counties named, with the exception of Mr. Allis's Yorkshire record, and one, which has not been confirmed, in Westmoreland. I know of no locality for this interesting and handsome species in the British Isles; yet in the collection of Dr. P. B. Mason at Burton-on-Trent are two ancient specimens, once in the possession of Mr. Haworth, and to all appearance of the same variety as those already noticed, and presumably British, but without labels of locality. One of these bears an old label "*obscura*," the other "*perfusca*."

Abroad its range is throughout Central Europe, the temperate portions of Northern Europe, Northern Italy, the Ural Mountain districts; and the mountain regions of Central Asia.

It may serve as a curious illustration of the difficulty experienced by those who desire to furnish every species with an *English* name if I point out that in pursuit of this object one of our more recent writers called the species just treated of "The Conformist" and the following "The *Nonconformist*"!!

4. **X. lambda**, *Fab.*; **Zinckenii**, *Tr.*—Expanse $1\frac{1}{2}$ inch. Fore wings narrow, blunt; soft glossy slate-grey, divided almost entirely into rounded clouds with black edgings and softenings; a deep black basal streak is followed by two oblique black lines which join a longitudinal black streak. Hind wings smoky-grey with a hoary sheen.

Antennæ of the male stout, minutely ciliated, reddish-brown, white at the base; palpi very broadly tufted, greyish-white streaked with black, apical joint very short; eyes black; eyelashes abundant and conspicuous, deep black; head prominently and rather flatly tufted, but the tufts

hardly divided, greyish-white mixed with slate-grey, a small tuft at the base of each antenna; thorax squared, smooth and rather flattened, slate-grey, a black line edged with white borders the back of the collar, top crest short and small, tipped with white, back crest flat and obscure; fascicles white; abdomen rather flattened, pale yellowish-brown, lateral and anal tufts broad, whitish-brown. Fore wings rather narrow but regularly increasing a little in breadth to the hind margin; costa very faintly arched, hind margin rounded, but suddenly very oblique towards the anal angle, hardly crenulated; dorsal margin straight; colour shining pale slate-grey, the whole broken up into rounded clouds by blackish or brownish shades and edgings; from the middle of the base is a deep black streak which at a short distance curves up and throws off black clouds; just beyond it the first line, in broken black streaks and angled fragments, placed obliquely and edged with white, throws back black and white dots along the principal nervures; from its angle below the median nervure arises a straight deep black line to the second line—or rather where the second line should be—and is there interrupted by a white streak, beyond which it is continued by a more slender black streak edged below with white, to the anal angle; above, a portion of the second line is indicated by the faintest possible pale line edged with grey dots; subterminal line deep black, much indented, thickened in the middle and there throwing inward one or two black wedges, also clouded outwardly, but inwardly edged with whitish-grey; orbicular stigma obscure, open at the upper side, edged otherwise with black; reniform stigma also obscure, broad, tinged with red-brown, and edged with a fine black line, so as to fall into the general arrangement of dark-edged clouds; at its base is a curved black streak uniting with an oblique straight black central shade from between the stigmata; on the costa are four black dots, and beyond them two or three faint white dots in a smoky clouding; along the extreme hind margin is a series of black

dots; cilia grey dashed with darker. Hind wings smoky-grey with a yellowish sheen; nervures rather browner; cilia white. Female very similar.

Underside of the fore wings smoky yellowish-white, pearly-white along the dorsal margin; discal cell filled with long prostrate hair-scales. Hind wings yellowish-white, tinged along the costal margin with yellowish-brown; central spot very small and faint, smoky-black, followed by a faint slender similar transverse stripe. Body yellowish-brown; legs and leg-tufts purple-brown.

Variable in the shade of grey, in the brightness of the light rounded clouds, and in the blackness of their margins. The very few specimens hitherto seen here are not of the brighter forms but approach in some degree to the more slate-grey variety known as var. *somniculosa*.

On the wing in September and October.

LARVA bluish-green with five white longitudinal lines; spiracles yellowish, edged with brown; undersurface and feet pale green, the latter with the clasping-surfaces ochreous-yellow; head and dorsal shield pale yellow-brown; raised dots indistinct. Or, blue-green besprinkled with small white dots; having three white longitudinal lines on the back, and on the sides a yellow longitudinal stripe in which are placed the black-bordered, white spiracles. Head in both varieties green with two white dots, but in the first the mouth is yellow. (Hofmann.)

April till June on sallow, whortleberry, and sweet-gale, usually in wet or marshy situations.

PUPA ochreous-yellow, in a cocoon among marsh moss. Not more fully described.

Little or nothing is known in this country of the habits of this exceedingly rare moth. It has been taken, sitting on the trunks of trees, in the daytime, and at sugar at night. The first specimen noticed here was found sitting low down on the trunk of a tree somewhere on the Lewisham side of

London, in 1865, by a young collector who was engaged in digging for pupæ; and was recorded by Dr. H. G. Knaggs under the name of *Xylina Zinckenii*, Tr. More recently the capture of another in a similar manner, and in the same year, was put upon record by the late Mr. Edward Hopley. This one was found in the northern environs of London. Another appears to have been taken at sugar in the following year, between Dorking and Guildford, in Surrey, by the Hon. Spencer Canning. The next seems to have been secured in a similar manner in Darenth Wood, Kent, in 1870. In the collection of the late Mr. F. Bond is one labelled "Taken at Erith, Kent, September 1875, by Mr. Marshall." So far as I know no other specimen was obtained for twenty years until the end of September 1895, when the Rev. J. H. Hocking had the good fortune to secure a specimen at sugar, in his own grounds, at Copdock, Ipswich. Thus the seven specimens which have occurred in this country are divided between Kent, Surrey, Middlesex, and Suffolk. Abroad it has a rather wide range through Northern and Western Germany, Belgium, Livonia, Finland, Sweden, Lapland, and some parts of Russia; also Canada, Maine, Massachusetts, and New York, but known in North America as *X. Thaxteri*.

5. **X. rhizolitha**, *Fab.*; **ornithopus**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{8}$ inch. Fore wings narrow, greyish-white, finely marbled and dusted with smoky-black; a curved and forked black streak at the base, and a smaller one, forked at each end, below the obscure stigmata. Hind wings grey-brown.

Antennæ of the male stout, simple, faintly ciliated, dark brown, the back of the shaft greyish-white; palpi loosely tufted, greyish-white streaked with black; eyes leaden black, the lashes rather short and stiff, deep black; head prominently tufted, the scales almost divided into two pairs of points, greyish-white; thorax of the same colour, dusted

with brown, rather flattened, squared and smooth; a short black bar edged with white lies across the front of the collar; top crest flatly conical but small; back crest a mere flattened tuft; fascicles white; abdomen rather flattened, greyish-white dusted with brown, dorsal region, near the base, covered with long pale hair-scales in which is sometimes a dark spot not raised into a crest; lateral tufts small; anal tuft squared, smoky-white. Fore wings narrow, the costa straight or nearly so; apex rounded; hind margin crenulated and gently curved; dorsal margin nearly straight; colour white dusted with grey; arising from the middle of the base, a conspicuous curved deep black streak is forked at a short distance, and slightly shaded off beyond; a few pairs of very faint streaks and angles indicate a broken first line; second line more complete but even more indistinct—a double series of grey curves and crescents throwing off darker dots on the nervures; sub-terminal line a series of small white dots in a faint stripe of grey clouding; this at the anal angle is darker and encloses a curious forked white streak; orbicular stigma only suggested by two faint black streaks which represent its front and back margins; reniform stigma large, similarly suggested, and also by a curved black basal streak, above which is a small faintly fulvous cloud; below this an angulated black streak, representing the claviform stigma, is connected at its apex with a short straight black bar by which it is joined to the only black angle of the second line, and thus becomes forked at each end; this central portion of the wing is faintly clouded with black atoms, a series of oblique black spots ornaments the costal margin, and another of deep black dots the extreme hind margin; cilia greyish-white. Hind wings moderately broad, with the hind margin very sinuous; smoky-brown, a little paler at the base, nervures and extreme hind margin rather darker; cilia white clouded with brown. Female closely similar.

Underside of the fore wings greyish-white, clouded in the middle with smoky-grey; a smoky-black cloudy spot repre-

sents the reniform stigma; hind margin dotted with black. Hind wings white, faintly dusted with purplish-grey, and with yellowish-brown along the costa; central spot large, black, beyond it is a slender faintly brown transverse line. Body purplish-white or reddish-drab; legs white or grey-white streaked with black.

Hardly variable, though occasionally the ground colour is a little tinged with smoky-grey, in which case the stigmata usually remain pale.

On the wing in September and October, and after hibernation, from February till April; but it only seems to hibernate during severe weather, and has been met with even in December.

LARVA cylindrical and rather uniform in thickness; head full and rounded, delicate green with a patch of paler freckles on the side of each lobe; ground colour rather transparent, pale bluish-green, thickly sprinkled on the back with opaque minute whitish freckles; on the back of the second segment are four whitish dots; on the rest of the body the dorsal line is opaque, whitish, finely edged with darker green, but so much interrupted as only to appear at either end of each segment; the subdorsal shows similarly as a broken whitish line, but is less conspicuous, while the spiracular line is indicated still more faintly, existing as an interrupted series of larger whitish freckles than those which besprinkle the skin; these on the undersurface are more sparingly scattered than above, and it is of a yellower green; the raised dots are of an opaque white ringed with unfreckled ground colour, and each bears a fine whitish hair; spiracles white, delicately outlined with black; legs well developed and terminated by sharp whitey-brown hooks.

The infant larva is whitish, with the head buff, but after the first moult opaque white dots and hairs may be discerned by the aid of a lens; when three weeks old greenish-white with the white raised dots distinctly visible; a week later the

bluish-green colouring with white freckles and with indications of the lines begins to be assumed. (Adapted from Mr. Buckler's description.)

May and the beginning of June, on oak, feeding openly upon the leaves, which it closely resembles in colour.

PUPA stout in proportion ; head and thorax rounded ; wing-covers long ; the tip of the abdomen rather bluntly rounded off, having at the end a small rough knob furnished with two small spikes curving a little outwards toward their extremities ; colour mahogany-brown and very glossy. In a cocoon of fibrous particles spun together and smoothly lined with pale grey silk. (W. Buckler.)

The moth very often sits during the day upon the trunk of a tree, not confining itself to oak trees, but so greatly favouring the Scotch fir that one may calculate almost with certainty upon finding one or more specimens on any day in the late autumn in any wood of these trees in the South of England. In this position it would be very conspicuous but for its close resemblance to a drop of bird's excrement. In the evening it is strongly attracted by ivy-bloom and sugar, and will feed upon ripe blackberries or rotten apples ; in the spring, after hibernation, it may be found, very much more rarely, at sallow-bloom. It pairs and deposits its eggs at this season. Apparently never abundant, but spread over the whole of the South of England to Oxfordshire and the Eastern Counties, though scarce in Cambridgeshire ; rare in Warwickshire, and hardly noticed elsewhere in the Midlands ; much more frequent in Herefordshire and Worcestershire, but scarce in Lancashire, Cheshire, and Yorkshire. Probably widely distributed in Wales, since it occurs, not very rarely, in Carmarthenshire and Pembrokeshire. Rare in the South of Scotland, being only recorded from the districts of the Tweed and Solway ; but also found in the extensive woods of Moray. More widely distributed in Ireland, and recorded from the counties of Dublin, Wicklow, Waterford, Cork, Kerry, Sligo, Cavan,

Westmeath, and Louth, and from Enniskillen. Abroad widely distributed through Central Europe, Southern Sweden, Courland, Northern Italy, Southern Spain, and Southern Russia.

Genus 82. **XYLOCAMPA.**

Antennæ naked, simple; eyes naked, having long curled front and back lashes; head doubly tufted with projecting scales, and with broad tufts at the bases of the antennæ; thorax crested at the back but hardly so on the top; abdomen provided with three or four moderate-sized crests; fore wings rather short, narrow at the base, crenulated behind; in the hind wings vein 5 hardly reaches the cross-bar.

We have but one species.

1. **X. lithoriza**, *Bork*; **areola**, *Stand. Cat.*—Expanse $1\frac{1}{4}$ to $1\frac{3}{8}$ inch. Fore wings narrow at the base, broader behind, the hind margin crenulated and spotted with black; colour pale grey, marbled with black and white; orbicular stigma extended *below* the median nervure in a rounded blotch which unites it with the reniform. Hind wings smoky-white.

Antennæ of the male rather short, thick, naked, light brown; palpi short and small, greyish-white, abundantly tufted with long black hair-scales; eyes black; lashes also black, long, and curled; head densely and prominently tufted, the tufts divided into two ridges, pale grey dusted with black; at the base of each antenna is a large black tuft surrounded with pale grey; collar large, raised, and peaked, whitish-grey, barred at the back of the head, and more broadly immediately above, with black, above this twice barred, more slenderly and loosely, with the same; remainder of the thorax covered with fluffy greyish-white scales mingled with black; back crest small and obscure; fascicles thick and long, smoky-white; abdomen shining pale grey, barred with black; dorsal crests brown, the second and third conspicuous;

lateral tufts spreading, tinged with purple; anal tuft flattened and rather squared. Fore wings somewhat short; costal margin nearly straight; apex bluntly angulated; hind margin oblique, much rounded, and faintly crenulated; dorsal margin nearly straight; colour greyish-white or purplish-white, much clouded and dusted with black; basal line suggested by a black dot on the costa; below the median nervure arises, from the base, a black streak which almost joins the first line; the latter is black, edged inside with white, irregular, looped, and angulated; second line black, repeatedly angulated toward the dorsal margin, only faintly indicated above; between these two lines the space between and below the stigmata is more intensely dusted with black than elsewhere, especially a longitudinal broad bar under the stigmata, which often is quite black or definitely edged with black; orbicular stigma flattened as to its usual position, but in some sort doubled by an extension *below* the median nervure, linking it with the reniform, which also is large; both are clouded with grey and edged with black; there is no indication of a subterminal line, but along the hind margin is placed a conspicuous row of black dots or spots, wedge-shaped except at the anal angle, where two larger ones coalesce and extend inward so as to join the longitudinal blackened bar; cilia of the ground colour very prettily spotted with dark grey, the paler colour running out to the tip of each crenulation. Hind wings rather short, evenly rounded; pale smoky purplish-brown; costal margin pearly greenish-white; cilia dusky-white. Female very similar.

Underside of the fore wings smoky-grey, whiter and dusted with dark grey along the costa and hind margin; dorsal margin pearly-green; on the costa beyond the middle is a short black bar. Hind wings dusky-white, dusted with brown along the costa and with grey behind; central spot lunate, black; beyond it is a slender dotted black transverse line. Body and leg-tufts grey dusted with black; tibiae black, barred with white.

Only a little variable in the intensity of the dusting of black, and of the flush of purple, or of grey, in the ground colour, as already suggested, but in some specimens the *stigmata* are tinged with purplish-red rather than grey, or the longitudinal stripe of black atoms partially disappears.

On the wing in March and April.

LARVA elongated and much attenuated at each extremity; anal prolegs projecting backward; twelfth segment raised into a slight hump; head rounded, pale brown; body ochreous with the back slightly darker; dorsal line paler and most conspicuous on the head, second, twelfth, and thirteenth segments, where it is edged with black; it divides a very faint dorsal diamond pattern; subdorsal lines slender, pale brown; spiracular lines darker; spiracles black; undersurface furnished with a darker central line and a black spot on each segment. (C. Fenn.) Mr. Buckler's figures vary from pale drab to pale brownish-slate colour, with darker stripes, or with a black spiracular line. A singular-looking larva, appearing as though stretched out to the utmost; when young it is said to have two pairs of anterior prolegs ill-developed, and to have a habit of resting with all the anterior segments raised straight from the surface on which it is placed, in the manner of a larva of one of the *Geometridæ*.

May to the beginning of July on honeysuckle, feeding at night, hiding during the day upon the stem of the plant.

PUPA rather elongated, tapering very suddenly toward the anal extremity, which is furnished with a short blunt projection; dark mahogany-colour; abdomen slightly paler. On or under the surface of the earth in a very hard, egg-shaped, shell-like cocoon of silk covered with earth, usually attached to a root or a stone. (C. Fenn.)

The moth sits in the daytime upon tree-trunks or palings, where honeysuckle is growing; and in some districts, as in South Wales, particularly affects the substantial wall-piers of

grey limestone upon which the field-gates are hung ; so fond is it of these that I have found four or five moths sitting about one gateway, and their resemblance to the limestone was so accurate as to make their detection difficult. When a tree-trunk is selected it is usually one which is well covered with lichens, so that the moth is equally well concealed ; yet curious exception is made in favour of Scotch fir trunks, upon which it will often sit quite exposed. It flies rather late in the evening, and visits willow-bloom on very warm nights, yet hardly settles down, or, if it does so, flies off at the least alarm, and usually buzzes round and feeds upon the wing. It has been taken, though rarely, at sugar. Never a very abundant species, but found fairly commonly all over the southern half of England, and less frequently or more locally over the remainder. Also apparently throughout Wales, and commonly in the southern portion. In Scotland it seems only to have been observed in the extreme south, and in the far north-west in West Ross. Widely distributed in Ireland, and recorded from Dublin, Wicklow, Galway, Sligo, Monaghan, Tyrone, Down, Antrim, Armagh, and Derry. Abroad its range is mainly through Western Europe and Asia Minor.

Genus 83. **LITHOMIA.**

Antennæ notched and tufted ; palpi short ; eyes naked, with thick back lashes ; thorax rather narrow, faintly crested at the back ; abdomen tapering, not crested ; fore wings very long, bluntly pointed, oblique behind, deeply wrinkled and rolled round the body when at rest ; hind wings broad ; discal cell open and vein 5 disconnected.

We have but one species.

1. **L. solidaginis**, *Hüb.*—Expanse $1\frac{1}{2}$ to $1\frac{7}{8}$ inch. Fore wings long, rather narrow, apex produced, hind margin crenulated and sinuous ; shining pale grey shaded with white and dark grey ; orbicular stigma *very* small, sometimes duplicated ; reniform large, greyish-white ; beyond are two or

three deep black arrow-head marks. Hind wings white, shading off to smoky-grey.

Antennæ of the male simple, minutely ciliated, grey-brown ; palpi rather slender, grey-brown, scantily tufted with pale grey hair-scales ; eyes black, lashes long and black ; head prominently tufted, the projecting scales having a shallow dividing channel across the face, and beneath it, on each side, the commencement of a black bar, otherwise pale grey dusted with brown ; collar of the same colour, but barred across the middle with black, and beneath this faintly with brown ; remainder of the thorax light grey, the scales drawn together at the back into a long crest which projects over the base of the abdomen and is blackened beneath ; fascicles white ; abdomen greyish-brown ; lateral tufts small ; anal tuft long and contracted, whitish-grey. Fore wings long and narrow, with the apex produced and bluntly pointed ; costa very slightly arched ; hind margin crenulated, very oblique, hollowed below the tip, then filled out and slightly angulated ; dorsal margin straight to near the base, then gracefully curved in ; colour very pale slate or whitish-grey and unusually glossy ; from the base arise three hairlike black streaks, one on the median nervure and one each close above and below it, also two more, oblique and bent, nearer the dorsal margin ; first line black or black-brown so deeply and acutely angulated as to appear like additional longitudinal hairlike lines ; in character with this the nervures are also indicated throughout by similar black lines ; second line a series of short deep crescents between the black nervures ; subterminal line a white, indented, much undulated stripe, edged inwardly by a long pale cloudy shade, and in the middle by two conspicuous, slender, deep black wedges ; outside it is a series of small grey clouds ; orbicular stigma quite small, pale grey edged with black, and usually accompanied by a rather smaller similar round spot ringed with black, both placed in a broad dark grey or cloudy-black central shade which crosses the wing ; reniform stigma large, white edged

with black, and containing a grey internal frame or edging ; costa beyond the middle minutely dotted with white ; at the extreme hind margin is a slender, deeply scalloped, white line ; cilia dark grey. Hind wings rather produced at the apex, the hind margin hollowed below it, and thence sinuous and not much curved ; smoky-white with a pearly gloss at the base shading off to smoky-grey at the hind margin ; cilia white. Female quite similar, yet with a stouter body and small anal tuft.

Underside of the fore wings smoky-grey, paler at the margins ; costa toward the apex dotted with white ; an obscure black cloudy spot at the reniform stigma. Hind wings white dusted with grey, and toward the base with brown ; central spot round, black, followed by an undulating pale brown transverse stripe. Body and legs grey-brown.

Variation seems to be in some degree local ; specimens from South Yorkshire often have the middle portion of the fore wings much blackened ; many of those from Cannock Chase, South Staffordshire, have the margins, the costa especially, shaded with brown, while in those from North Staffordshire the hinder half of the wings is much whitened. Fine examples of these forms have been furnished by Mr. F. C. Woodforde. Among others sent by Mr. A. Horne from Aberdeen are some having a broad smooth paler band across the middle of the wing and the basal region darkened ; others in which the central area is prettily rippled with dark grey, and the first and second lines are very distinct and faintly duplicated. In the collection of Mr. S. J. Capper is a specimen having a broad pale transverse band filling the space from the first line to the central shade ; another has a very narrow black central stripe. The presence in many specimens of a second orbicular stigma in the discal cell is very curious and unusual.

On the wing in August and to the middle of September.

LARVA moderately stout, cylindrical ; head large, rounded,

polished, red-brown reticulated with dark brown; on the second segment is a red-brown or blackish blotch divided by the dorsal and subdorsal lines; general colour dark purplish-brown, sometimes paler, with a slight violet tinge, and faintly irrorated with grey; dorsal line paler, threadlike. inconspicuous; a series of oblique blackish subdorsal streaks is most strongly indicated on the fifth, sixth, eleventh, and twelfth segments, especially on the twelfth, where those on each side are united by a transverse black dash; these oblique markings are frequently produced to the dorsal line as greyish Vs with the apex behind; spiracular stripes broad and very conspicuous, yellowish-white edged above with velvety-black; usual spots distinct, whitish or yellowish, edged with grey; spiracles whitish; undersurface, legs, and prolegs reddish or red-brown, paler than the ground colour.

When young, dark purple with the usual raised spots white; spiracular stripe very conspicuous, white, or in some cases pale chrome-yellow; dorsal line whitish, threadlike, and a black transverse dorsal dash on the twelfth segment. (C. Fenn.)

May, June, and July, on whortleberry (*Vaccinium myrtillus*), bearberry (*Arctostaphylos uva-ursi*), sallow, birch, hawthorn, and heather, doubtless feeding principally at night.

PUPA elongate; anal extremity spiked; mahogany-red; incisions and anal segment shaded with dark grey. (C. Fenn.) Under moss or among loose earth, in a silken cocoon.

The moth sits in the daytime upon tree-trunks, walls, rocks, and dead sticks of heather or bracken, in a most singular attitude. The Rev. C. F. Thornevill writes: "We found them sitting upon the trunks of some old birch trees in a very peculiar attitude, which reminded me of the fable of the ostrich thinking to escape from its pursuers by hiding its head in the sand; the head and thorax of the insect are thrust deeply into the crevices of the bark, while the body, with the wings wrapped closely round it, sticks out at right

angles, and is thus very conspicuous, though the colour of the wings closely resembles that of the birch bark. I visited the same spot on a wet day, and found that the trees were now entirely deserted, while the moths were perched on dead stems of bracken or burnt sticks of heather at a height of a foot or so from the ground; but on a third day, visiting the spot in fine weather, I came to the conclusion that only a small proportion were to be found on tree-trunks, while by far the larger number preferred the dead sticks and bracken which still lay in plenty all around." Mr. G. T. Porritt also says: "It sits with its head pressed closely to the wall or bark, its hinder portion stiff and projecting, and bears the most accurate resemblance to the excrement of a grouse that can be imagined; it is wonderfully deceptive." The fore wings, when so resting, are drawn tightly round the body, and the hinder portion squeezed together and curiously wrinkled, and it really has a very considerable resemblance also to a bit of stick or roll of the thin bark of the birch. At dusk it will come to sugar, heather-bloom, and ragwort-blossom. Its favourite haunts are open woods with plenty of heather and whortleberry, or moors with scattered trees; but it may sometimes be taken on the open heathery moors far from any trees, and in those seasons in which it is abundant it has even been known to enter gardens. But its haunts are mainly mountainous districts, and so far as I know its most southern locality in these Islands is the hill district of Cannock Chase, South Staffordshire; thence it is found locally in suitable places in North Staffordshire, Derbyshire, Salop, Cheshire, Lancashire, Yorkshire, and Cumberland, and has once been taken in Durham. Very local in the South of Scotland, yet found in the Solway, Clyde, and Forth districts; also in Perthshire, Inverness-shire, Moray and Sutherlandshire, and sometimes abundantly in Aberdeenshire. It cannot well be absent from the mountains of Wales, yet I find no record. Abroad it ranges through Northern Europe and a considerable portion of Central Europe—specimens

from the Hartz Mountains of Germany being very brightly coloured—also the Ural Mountain district, and the mountainous regions of Central Asia. In America it is found in Canada and the Hudson's Bay territory, of a rather large size and slightly different tint of grey, but otherwise agreeing accurately; it is there known under the name of *Germana*.

[**Calophasia platyptera**, *Esp.*—A pretty little species of an inch expanse, something like a small *Cucullia*. Antennæ simple, ciliated, brown; head and thorax greyish-white; fore wings rather narrow, broader behind; smooth shining white, shaded with pale brown and grey-brown; markings very obscure; nervures faintly brown; first line represented by a brown dash on the costa, and by one or perhaps two long sweeping angles of a brown line above the dorsal margin, but it is difficult to say whether the upper of these is not really the claviform stigma much elongated; a short distance beyond it a long curved streak arises on the dorsal margin as a partial second line, but disappears before the middle of the wing, though there is a pair of brown dots opposite to it on the costa; no upper stigmata nor subterminal line, but the dorsal margin is clouded with brown, except toward the anal angle, the portion between the first and second lines especially so, and from this a faint darker cloud proceeds straight towards the apex; along the hind margin is a series of deeper brown streaks upon the ends of the nervures and continued through the cilia, which are white and rather long. Hind wings white tinged on the nervures and toward the hind margin with brown; cilia white.

The larva is found upon *Linaria* in the South of Europe.

The pupa has been found in Morocco enclosed in a cocoon formed of coloured lichens.

The capture of a single specimen, by himself, near Brighton, in September 1896, was recorded by Mr. J. T. Carrington. This specimen was shortly afterwards exhibited by its captor at a meeting of the South London Entomological Society; he

stated that he beat it out of a hedge, that it fell and settled on a blade of grass, and was rather restless, yet allowed itself to be boxed.

It inhabits most parts of Southern Europe, Carniola, Southern Switzerland, Crete, Asia Minor, and Northern Africa. It seems hardly desirable to include this as a British species on the occurrence of a single specimen, which may very possibly have been accidentally introduced. Should it really have effected a settlement in this country, evidence will doubtless soon be forthcoming.]

[*Calophasia linariæ*, Schiff.; *lunula*, Staud. Cat.—Also a rather small species— $1\frac{1}{8}$ inch in expanse—and very pretty, bearing a sort of resemblance to *Eremobia ochroleuca*. Antennæ simple, ciliated, brown with a white tuft at the base; head white, barred in front with black; collar white, edged with pale brown, and sharply twice barred with dark brown; thorax pale brown; fore wings rather narrow but dilated toward the apex and hind margin, which are unusually rounded; colour greyish-white, much clouded with pale olive-brown; along the median nervure at the base is a slender black streak; first line double, arranged into two large curves which have between them, on the median nervure, a white streak; second line arising on the dorsal margin only just beyond the first, double, olive-brown, forming one grand curve to the middle of the wing, then obliterated, but near the costa again visible; the stripe enclosed in each double line is brownish-white; central shade pale olive-brown; orbicular stigma flattened, white, sharply edged with black; reniform stigma erect, narrow, pure white, edged with black; claviform flattened, white, edged with black; beyond is a series of six or seven thickened black lines between nervures, running into the hind margin, some of them broken by a wavy white clouding which seems to represent the subterminal line; all these last markings lie in an oblique shade of olive-brown which runs into the apex

of the wing; cilia long, olive-brown, broadly dashed or chequered with white. Hind wings smoky-white with brown nervures, and a broad smoky-brown band along the hind margin; cilia white.

The larva feeds upon *Linaria vulgaris*, *L. repens*, and *L. genistifolia*, and is said to be pearly-white, or bluish-grey, with yellow subdorsal and spiracular lines.

Recorded as British by Stephens (Illust. 3, 94), who states that specimens in his own collection and that of the British Museum were captured at Woodside, near Epping, Essex, in June 1817. The insect is correctly figured by Wood on the same authority; but no other case of the occurrence of the species in these Islands is on record, and there is some cause for doubt whether a mistake was not made in the original statement. Certainly there is no reason to believe it to be now resident here, though its absence is somewhat inexplicable. Abroad it has a wide distribution over Central Europe and the warmer portions of Northern Europe, Northern Italy, Dalmatia, Bulgaria, and Southern Russia.]

Genus 84. **CALOCAMPA.**

Antennæ long, stout toward the base, faintly ciliated; palpi short and blunt; eyes naked, front lashes long, back lashes curled; head extremely blunt in front; thorax broad, squared, and high-shouldered, with very small top and back crests; abdomen broad, flatly rounded, not crested; fore wings long, stout, with unusually straight costal and dorsal margins, and crenulated waved hind margin; hind wings broad, cross-bar bent and hardly complete; vein 5 arising from half way below the angle. Wings drawn closely together, rolled and wrinkled when at rest.

LARVÆ smooth, of unusually beautiful bright colouring, mainly green. On low-growing plants.

PUPÆ subterranean.

We have two species which may readily be distinguished.

A. Fore wings drab clouded with smoky-black, two black arrow-heads in the subterminal line. *C. exoleta*.

A². Fore wings reddish-drab clouded with red-brown, a long black streak from the reniform stigma to the subterminal line. *C. vetusta*.

1. **C. exoleta**, L.—Expanse $2\frac{1}{4}$ to $2\frac{1}{2}$ inches. Fore wings very long, bluntly pointed, drab, broadly clouded toward the dorsal margin with smoky-brown, orbicular stigma irregularly clouded or divided with black; reniform large, clouded and edged with black; beyond it are two slender black arrow-heads before the hind margin. Hind wings smoky-brown.

Antennæ of the male long, stout and notched toward the basal portion, ciliated, and every notch tufted with minute bristles, light brown; palpi short and thick, broadly tufted and blunt in front, chestnut-brown, almost concealed among dense masses of short, thick, blunt, black hair-scales; eyes naked, olive-brown, spotted with black; lashes black, those at the back curled over; head evenly rounded and unusually blunt in front, lower portion black shaded with red-brown, above this is an angulated umbreous line beneath the antennæ, on the upper surface the scales are divided into two large yellow-brown masses, and at the base of each antenna is a separate socket-like tuft, black above, brown below; collar very large, front portion yellow-brown, top and back portion dark purple-brown; rest of thorax much squared, and having a raised pale drab epaulet at each shoulder, the lappets and dorsal portion reddish-black and having a small central deeper black divided crest; back of the thorax brownish-drab, the scales drawn together into a flattened crest, which is tipped with black; fascicles dirty-white; abdomen broad and flattened, yet rounded up in the middle, basal segments covered with long yellowish-white hair-scales which shade into pale purple-brown in the middle segments

and into reddish-black on the hinder, but the broad lateral and narrower anal tufts are yellowish-drab. Fore wings stout and strong, much elongated, straight and rather narrow; costa almost straight to the apex, which is bluntly rounded; hind margin oblique, very little curved, but hollowed toward the anal angle and regularly crenulated; dorsal margin straight; colour pale drab, clouded, especially in the middle area, with black; basal line suggested by a minute black streak on the costa, and another on the median nervure; first line a faint series of very long smoky-brown angles; second line similar, almost equally obscure, except that it is made noticeable by black points on the nervures; a series of whitish angulated streaks and elongated clouds suggests a faint subterminal line, at the back of which, in the middle, are two slender deep black arrow-heads pointing inwards, and elsewhere a few cloudy-brown streaks; this is followed by similar clouds along the hind margin; orbicular stigma large, elongated, upright, faintly edged with black, and containing a sort of smoky-brown frame or internal edging, which is often constricted, and sometimes forms itself into three blackish rings placed perpendicularly; reniform stigma large, edged also with black, and the lower portion filled in with the same, the middle containing a pale drab spot edged with black; sometimes the hinder edge of this stigma is bordered by a smoky-black cloud which throws off short points backward; middle portion of the dorsal region more particularly clouded with smoky-black than the rest of the centre of the wing, or the costal region similarly darkened; cilia pale umbreous, dashed and edged with black. Hind wings broad and ample, apex rather produced; hind margin slightly hollowed below it, thence sinuous and crenulated but not much curved; colour smoky-brown with a purplish gloss, base paler, nervures rather darker; central spot large, smoky-black; extreme hind margin slenderly edged with whitish crescent-like clouds, and the adjacent cilia white; dorsal margin and cilia reddish-brown. Female very similar, the

antennæ threadlike; abdomen broad and stout, very suddenly narrowed to a point at the anal segment.

Underside of the fore wings brownish-drab, basal portion shaded with pearly-white; central area abundantly clothed with long loose smoky hair-scales; subcostal region similarly clothed with reddish hairs; a black spot indicates the reniform stigma, and beyond it is a curved smoky-black transverse stripe; hind margin blackened. Hind wings brownish-white with the nervures distinctly dark brown; costa dusted with yellow-brown; central spot ill-defined, black-brown; beyond it is an abundantly rippled reddish-black transverse stripe; hind margin streaked with the same colour. Body and legs black-brown, clouded with purplish-red.

Hardly variable except in the darkness and extent of the central smoky-black clouding, and of the black edging of the reniform stigma, as already indicated; but in Dr. Mason's collection is a specimen having the fore wings wholly suffused with smoky-black clouds.

On the wing from the end of September to November, then hybernating, but only in severe weather; and again upon the wing from March sometimes until May.

LARVA elongated, moderately cylindrical, but tapering a little toward the head and rather suddenly at the hinder extremity; head pale-green or yellowish-green; body rich bright green with hardly any indication of a dorsal line; subdorsal lines broad and conspicuous, rich yellow; along their upper edge is sometimes a series of oblong black blotches dotted with white; spiracular stripes scarlet edged beneath with white or yellow; spiracles white; raised dots also white in black rings and those on the dorsal surface often united in pairs by intermediate black dashes; prolegs very large and stout, bright green, as also are the legs and under-surface. Very few larva of beauty equal to this are known here.

April to July, on the leaves and flowers of low-growing

plants—asparagus, dock, groundsel, knot-grass, yellow iris, scarlet geranium, clover, thistles, potato, *Stachys sylvatica*, *Serratula tinctoria*, *Sedum telephium*, *Petasis officinalis*, and many others; also occasionally upon leaves of hazel, poplar, lime, and alder; feeding both by day and by night, and sometimes eating voraciously in the sunshine.

PUPA large and stout, but with a thin and delicate skin; the portion in front of the head, covering the mouth, sharply angulated, almost beaked, tipped with black; wing and limb covers rather compact, brilliantly glossy and devoid of sculpture; but the back of the corselet thickly inscribed with fine lines, channels, and pits; dorsal and abdominal segments smooth and shining; anal segment very bluntly rounded off; cremaster thick and short, wrinkled, black, furnished with two strong straight black spikes; remainder of the surface rich chestnut-red. In a hard but brittle cocoon of earth apparently without admixture of silk, under the surface of the ground.

The moth is rarely if ever seen in the daytime. Probably it hides among herbage and fallen leaves. At rather late dusk it comes readily to sugar and ivy-bloom, or after hybernation occasionally to sallow-bloom; and it is at this season that it pairs and deposits its eggs. Its appearance when at sugar, or sitting, as it sometimes will at night, on the trunk of a tree, is precisely that of a short bit of brown stick. Its squared shoulders and wings wrapped closely to the body, even squeezed together and crumpled behind, together with its drab and smoky-brown colouring, make the resemblance extraordinary, and it is even heightened by the marking of the blackened reniform stigma, which appears precisely like a knot on the side of the supposed piece of stick. Apparently found throughout England, though usually scarce or very local in the southern counties. It has, however, been taken commonly in the Dartmoor district of Devon, in the Cambridgeshire fens, and sometimes in Oxfordshire, Berks, and

Norfolk. Passing northward it becomes more plentiful, and in some parts of the North of England is common enough; also in Scotland in the districts of the Tweed, Solway, Clyde and Forth, abundant in Perthshire and Moray, and fairly common even in the Orkneys. Doubtless in all parts of Wales, since it has been found at Colwyn Bay, Dolgelly, and elsewhere in North Wales, in abundance in Carmarthenshire, and more rarely in Pembrokeshire. Very widely distributed in Ireland but always scarce, yet recorded from Dublin, Wicklow, Waterford, Cork, Kerry, Galway, Sligo, Mayo, Monaghan, Louth, Down, Antrim, Armagh, Fermanagh, Tyrone, and Derry. Abroad its range extends over the whole of Europe except the extreme north and south, Asia Minor, Siberia, and Japan. In the last-named is a form more than usually clouded with smoky suffusion, which has received the name of *fumosa*.

2. **C. vetusta**, *Hüb.*—Expanse $2\frac{1}{4}$ to $2\frac{1}{2}$ inches. Fore wings very long, straight and rather narrow, bluntly pointed; pale reddish-drab, clouded along the dorsal half with red-black; reniform stigma edged with a black or red-black cloud from which a long single black streak runs to the sub-terminal line. Hind wings smoky reddish-brown.

Antennæ of the male long, slightly notched toward the base, ciliated with small tufts of most minute bristles, light brown; palpi short and thick, red-brown, edged with short, thick, blunt, black hair-scales; eyes and their lashes black; head densely scaled and very blunt in front, the face red-black with a paler cross-bar, becoming red-drab at the base of the antennæ, and above this pale reddish-drab, with a deep central division; front of the collar red-drab, faintly barred, in double arches, with white, fulvous, and deep black, above this it is purple-black; shoulders squared, and with raised epaulets, pale drab outside, but the back purple-black, the top crest very short, divided, black, the back crest a mere curved-up black tuft; fascicles reddish-white; basal segments

of the abdomen covered with long similar hair-scales; hinder portion yellow-drab clouded with tawny-red, and down the middle of the back with black; lateral tufts small; anal tuft rather compressed. Fore wings very long, rather narrow and straight; costa hardly curved; apex bluntly pointed; hind margin very oblique, faintly curved but decidedly crenulated; dorsal margin straight; colour yellowish-white at the base, shading to pale yellow-drab or reddish-drab; dorsal half of the wing strongly clouded and shaded with purple-red or red-black, its central portion becoming often almost black; basal line just hinted-at by two or three black-brown dots; first line disposed in a double or triple series of extraordinarily long angles so obscure as to be only visible through a lens when looking toward the *base* of the wing; position of the second line suggested by three or four black points and dots in the darker area of the wing; subterminal line an incomplete series of pale drab angles or arrow-heads which divides the purple-red clouding toward the hind margin; orbicular stigma only faintly indicated by three reddish-brown dots placed in an oblique line and surrounded by a pale area; reniform stigma rather more distinct, large, upright, partly edged with black, containing a red-brown cloud and above it an upright yellowish-white streak edged on each side with red-brown; outside it arises a long black streak which points and extends straight to the subterminal line; underneath the shadowy orbicular stigma is an elongated black blotch or streak which varies greatly in size and distinctness; costal margin beyond the middle dotted with white; cilia drab, dashed and tipped with black. Hind wings ample, rather pointed at the apex, hind margin faintly hollowed below it, thence sinuous; colour smoky-brown with a strong reddish flush and the dorsal margin much tinged with brick-red; central spot obscure, smoky-black; cilia white shaded with brown. Female, except that the antennæ are quite threadlike, very closely similar.

Underside of the fore wings reddish-drab; all the middle portion deeply clouded with smoky-black and covered with long hair-scales, as also is the subcostal nervure; reniform stigma visible as a similarly shaped black spot; costa toward the apex spotted with white, extreme hind margin with black; cilia blackened toward the tips. Hind wings reddish-white, clouded with tawny along the costal and hind marginal regions; central spot large, lunate, black; extreme hind margin streaked with black. Body and legs red-brown.

Variable, as already indicated, in the depth of the red-black clouding on the dorsal region of the fore wings, this in some specimens from northern and western districts being intensified nearly to deep black, while in other Scottish examples it is partially obliterated, leaving almost the whole wing reddish-drab. In two specimens taken near Haslemere, Surrey, where the species is very rare, there is a somewhat similar tendency, but the general colour is paler, more smoky, and not of so clear a red-drab. Occasionally specimens are so smoky, or tinged with grey, as closely to resemble *C. exoleta*, though even then readily distinguished by the long black streak outside the reniform stigma. Usually in these paler examples the black blotch or streak under the orbicular is smaller, sometimes only an ovate spot, while in the darkest examples it attains its greatest development.

On the wing in September and October, and after hibernation in March and April.

LARVA cylindrical, elongated; head rounded, rather large, glossy smooth light chestnut, divided in the middle by a faint yellow line; dorsal plate horn-colour, edged in front with black, and showing traces of the beginnings of the white longitudinal lines; body below the subdorsal lines pale greenish-grey; dorsal line slender, white, continuous; subdorsal lines rather broader, also white; the intermediate dorsal spaces completely occupied by longitudinal deep black stripes regularly dotted with white; spiracular stripe white,

edged above with black; spiracles light red; legs bone-colour; prolegs and undersurface pale greenish-grey. (Described from larvæ furnished by Mr. Robert Adkin for that purpose.) A form figured by Mr. W. Buckler has the dorsal surface green, with broad darker green subdorsal stripes which are dotted with white, and a slender purple spiracular stripe edged beneath with yellow. Another is described by Mr. G. T. Bethune Baker: "Ground colour apple-green with the back darker, and a pale green central stripe, on both sides of which is a row of small white spots, finely encircled with black, from the third to the twelfth segment inclusive, each row consisting of three spots triangularly disposed on every segment; spiracular stripe white, edged above by a black line; spiracles scarlet; legs yellow; prolegs tipped with pinkish-buff; head yellowish." In every variety the beauty of this larva is quite remarkable.

May to July on dock, sorrel, persicaria, yellow flag, various sedges, and other marsh or low-growing plants.

PUPA elongated, the thoracic portion very cylindrical; eye and antenna cases full and rounded; wing-covers more depressed; abdominal segments very strongly rounded and with deep divisions; anal segment bluntly and suddenly rounded off below, but its dorsal portion produced into a rounded and greatly pitted cremaster which, where joined to the dorsal portion of the segment, is hollowed out like a shell, and which bears at its tip two slender black points or spikes, and outside these two bristles; whole surface glossy deep red-brown. In a brittle cocoon of earth beneath the surface of the ground.

The moth doubtless hides during the day among moss, dead leaves, or herbage, upon the ground. It has even been found under a stone on the top of a mountain 2500 feet high. Its form when at rest is so wonderfully like a bit of dead stick, that even when several have been reared in a flower-pot I have looked steadily at them without realising that

they were anything alive. It comes at dusk to sugar or ivy-bloom very readily, and even to ripe blackberries when these are available; but in the spring is seldom observed, although this is the season in which it pairs and deposits its eggs. It only hibernates in severe weather, and will move about in winter whenever the weather is mild. Very scarce in the South and East of England, though it appears to have been found in almost every county, and seems to find a congenial locality on Dartmoor, Devon. Either scarce or local throughout the Midlands, and not very common in the West and North of England. Also scarce in North and South Wales. Far more frequent in Scotland, occurring throughout that country to the Orkneys and Shetlands, and in many localities in abundance; also common all over Ireland, even to the tops of the mountains, and sometimes abundant. Abroad it has a very wide range—Central Europe, all the temperate portions of Northern Europe, also Spain to Gibraltar, where, however, it is rare; Northern Italy, Southern Russia, and Siberia. Also apparently in North America, where a form known as *nupera*, but evidently only a richly tinted variety of the present, is found from the Hudson's Bay territory southward to Columbia, and westward to Alaska.

Genus 85. **CUCULLIA.**

Antennæ cylindrical, rather long, naked; eyes naked, having lashes at front and back; head furnished with prominent separate tufts; collar extremely large, forming a sort of hood to the thorax, which consequently is peaked at the top, also crested behind; abdomen elongated, furnished with four or five dorsal crests which sometimes are partially concealed. Fore wings long, narrow, pointed, the anal angle more than usually rounded off; hind wings short, the cross-bar angulated but weak and hardly closing the cell; vein 5 faint.

LARVÆ cylindrical, firm, shining, usually handsomely spotted or striped. On herbaceous plants, usually upon the blossoms, feeding quite exposed.

PUPÆ rather slender, soft, thin-skinned, having a considerable projection at the tips of the wing-covers, which contains the end of the long curled tongue.

Not an easy genus to tabulate; an attempt may be useful:

A. Costal and dorsal margins each occupied by a stripe of dark colour.

B. These stripes broad, rich chocolate, ground colour reddish-drab, size near 2 inches. *C. verbasci.*

B². The stripes narrow, dark red-brown, ground colour wainscot-brown; wings smaller and narrower.

C. lychnitis.

B³. Very similar, but ground colour more dull brown, stripes straighter and more parallel.

C. scrophulariæ.

B⁴. Dorsal stripe narrow, costal broad and diffuse, chocolate; ground colour silvery-grey. *C. asteris.*

A². The longitudinal stripes absent, fore wings grey mottled with black or brown.

C. The mottled colour purple-brown; upper stigmata distinct, three black streaks behind. *C. gnaphalii.*

C². The mottled colour black in transverse bands; ground rosy-grey; twin black dots in upper stigmata.

C. absynthii.

C³. The mottled colour grey-black; ground brownish-grey; brown clouds in the stigmata. *C. abrotani.*

A³. Without definite markings, except slender black longitudinal lines.

D. Fore wings narrow, brown-grey or dark grey clouded with black. *C. chamomillæ.*

D². Fore wings rather broad; pale grey shaded with darker, and toward the costa faintly with light brown.

C. umbratica.

1. **C. verbasci**, *L.*—Expanse $1\frac{3}{4}$ to 2 inches. Costa of fore wings strongly arched beyond the middle; hind margin deeply crenulated; pale wainscot-brown shaded with red-brown, and with a rich mahogany or dark chocolate stripe along the costal and dorsal margins. Hind wings white, shaded with red-brown; hind margin strongly crenulated.

Antennæ of the male long, simple, naked, light brown; palpi loosely tufted, yellow-brown shaded and striped outside with red-brown; eyes reticulated, deep black, lashes black; tongue very long; head whitish-brown, barred across the face with tawny, above this divided into four tufts, two above and two below the antennæ, and additional tufts at the bases of the latter, all tawny above, white beneath; collar extremely large, peaked, and divided in the middle, white with four faint tawny bars, and an edging at the back of purple-brown; shoulder lappets large and very long, white tinged with reddish-brown in the front half, edged at the back with tawny; middle area of the thorax disposed in large divided crests at the top and back, red-black shading to black at the tips, but faintly frosted with white; fascicles thick, white; abdomen pale reddish-brown with abundant very long white hair-scales on the basal segments, and on the dorsal ridge three prominent black-tipped crests, on the following segments are one or two less conspicuous tufts; lateral tufts spreading, purplish-white; anal tuft small, reddish-brown. Fore wings long and narrow; costa very faintly hollowed before the middle, beyond it strongly arched; apex sharply pointed; hind margin deeply scalloped and crenulated, rounded but slightly excavated above the anal angle, which is rather sharp; dorsal margin hollowed and gracefully curved; colour whitish-drab or wainscot-colour, tinged with pale tawny; entire costal region to the apex clouded with rich chocolate-red, shading off below, but toward the apex disposed in long stripes between the nervures; another broad chocolate stripe lies along the dorsal margin from near

the base to considerably above the anal angle upon the hind margin; this at its origin near the base of the wing is obliquely crossed by two deeper chocolate streaks which, with further long angulated faint tawny loops, form the first line; in the middle of the dorsal margin are two white crescents which, continued as excessively faint tawny streaks and dots, form a much angulated second line; with these faint exceptions there are no traces of the ordinary pattern of markings; above the middle of the hind margin are three or four cloudy chocolate-red streaks; outside these, along the extreme margin, is a regularly scalloped complete white line edged with reddish-black; on the costa toward the apex are two or three white dots; cilia pale brown with a slender purple-brown line running into the point of each crenulation, below the middle of the hind margin also dusted and streaked with black, and continued along the greater portion of the dorsal margin, where they are streaked with red-black and frosted with black and white. Hind wings small, rather pointed at the apex; hind margin sinuous and deeply scalloped; white, much shaded with smoky reddish-brown, which becomes dark at the apex and along the hind margin; nervures of the same colour, as is also the faint central lunule; cilia pale brown with the tips white, the two colours divided by a brown-black line, but toward the anal angle wholly white. Female accurately similar, hardly stouter.

Underside of the fore wings smoky-brown, shading off to pearly-white toward the dorsal margin; discal cell filled with long fluffy hair-scales; costal margin black-brown, dotted with white toward the apex; cilia purple-brown. Hind wings white, dusted along the costa and hind margin with dark brown; nervures similar; cilia white clouded with black-brown. Body pale reddish-brown; legs whitish-drab, streaked with tawny; leg-tufts large, purplish-brown.

Not variable, except in a slight degree in the depth of ground colour and of the dark stripes.

On the wing at the end of April and in May.

LARVA stout, rounded, smooth, with a few short scattered hairs; incisions of the segments compressed; head small, yellow, spotted with black; body greenish-white with a broad deep yellow transverse band on each segment from spiracle to spiracle; on each segment are also four large black dorsal spots, the second pair larger and elongated laterally; subdorsal line represented by two black spots and two black transverse lines on each segment; spiracles black, each followed by a black spot and having two obliquely placed black spots below it; legs and prolegs yellowish, the latter marked in front and the former behind with black; on the underside of the spiracles are two rows of irregular spots and streaks forming an interrupted band on each side of the legs; a white lateral spot, enclosing a black one, on each proleg; on the undersurface are two black spots each on the third to the sixth and eleventh to thirteenth segments, those on the fifth, sixth, and eleventh the most conspicuous. (C. Fenn.)

June and July upon mullein, more particularly the woolly species, *Verbascum thapsus*, and *V. pulverulentum*; *Scrophularia nodosa*, *S. aquatica*, and various non-British plants of that genus. It has even been found upon *Buddlea globosa*, a North American shrub cultivated in gardens. Unlike some of its allies, it eats the *leaves* of mullein and *Scrophularia* in preference to the flowers. From its habit of feeding quite exposed and most conspicuously in the sunshine it seems extremely likely to be destroyed by birds, but is so irritable that if touched it throws itself about, exuding a greenish fluid from its mouth, and tumbles so promptly down among the dead leaves of the plant that the danger is much obviated. There is some reason to believe that these larvæ are distasteful to birds, and direct evidence to this effect is furnished by several observers. On the other hand, the late Mr. D'Orville of Exeter distinctly states that he has had in various years hundreds of the larvæ upon the *Verbascum* plants which he cultivated in his garden, and that so soon as they became large enough to appear conspicuously upon the leaves they

were cleared off by birds. Probably the common sparrow, by his power of adaptation of himself to almost any circumstances, may have trained himself to the enjoyment of these tit-bits, and our experience of him lends force to the suggestion that he will probably appropriate anything in a garden which the proprietor especially desires to preserve. That this larva is distasteful to jackdaws is, I think, established.

PUPA hardly of the ordinary *Noctua* form, being broadest in the middle, yet having the wing-covers narrow. They are not much swollen, nor are the limb and antenna covers conspicuous, but the tongue-case is swollen from the base, and at the end of the wing-covers the case of its coiled tip forms a very considerable raised knob; spiracles distinct, oval, rather blackened; segmental divisions well marked; general surface smooth but not very glossy; hardly any sculpture except a little upon the back of the corselet; cremaster projecting, much flattened, rounded behind and showing no trace of spikes or bristles; general colour red-brown, anal tip black-brown; skin very delicate. In a cocoon of the size of a wood-pigeon's egg, very thick and tough and composed of layers of earth and silk; at some depth beneath the surface of the ground.

In this condition during the winter—but often through several winters, since but a small proportion of the pupæ produce moths in the first season. Out of a large brood fed up together, some will emerge in each following spring for four or five years, or even longer. The depth to which the pupa is buried is therefore a great protection.

The moth is very rarely seen either in the daytime or at night. Almost all the specimens in collections have been reared from larvæ. Once, however, I saw a specimen sitting in a hedge by which mullein was growing, and was astonished at its protective resemblance to the piece of dead stick upon which it was at rest. The rich shades of brown on the wings, which were clasped close to the stick as it sat lengthwise,

and the points of the hoodlike front of the thorax, the thoracic and abdominal crests, and the anal tuft, formed altogether a similitude to the excrescences and thorns of the stick which appeared almost miraculous. Since its tongue is so fully developed, it must surely frequent some description of flowers at night, but no such habit seems to be recorded of it, and certainly sugar forms for it no attraction. The only specimens which have come under my own notice at night have been seen sitting upon gas-lamps. Thus its distribution is only known by observation of its very conspicuous larva. Formerly it was frequent in the London district, but has now quite disappeared thence. Still common in all parts of the South and East of England in which mullein is plentiful, but more abundant in the West and in South Wales, where it is found upon *Scrophularia nodosa* quite as often as on mullein; perhaps most plentiful in Devon and Cornwall, and found in the Scilly Isles. Northward it reaches Worcestershire, Derbyshire, and some parts of Yorkshire, but I have no record from farther north, nor from North Wales. In Ireland it seems to be rare, and is only recorded from near Dublin and Wicklow. Abroad its range extends over Central and Southern Europe, including Turkey, where it is abundant; also the South of Sweden, Livonia, Asia Minor, and Armenia.

2. **C. scrophulariæ**, *Schiff.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Costa of fore wings very flatly arched beyond the middle; hind margin much contracted, closely crenulated; pale drab faintly shaded with red-brown, a dark umbreous stripe along the costa, and a red-brown stripe along the dorsal margin, the intermediate space *extremely even in width*. Hind wings white shaded with smoky-brown.

Antennæ of the male simple, naked, red-brown; palpi short, moderately tufted, purple-brown, paler inside; head very curiously tufted in front, a broad lip-like pair of tufts placed just above the palpi, and a large cup-shaped pair quite

round the antennæ, from the base of each of which projects a very small pointed whitish tuft, the rest pale brown tipped with red-brown; collar rather large, divided in the middle, ashy-white tinged in the middle with fulvous, and edged at the back with tawny-brown; shoulder-lappets reddish-white edged with white, and with a few red-brown dots; remainder of the thorax raised into red-black top and back crests which are frosted with white; fascicles white; abdomen not very long, reddish-drab, thickly covered at the base with white hair-scales, and having on the dorsal ridge two black crests tipped with white; lateral tufts small; anal tuft contracted. Fore wings narrow, rather constricted behind; costa very faintly arched at the base and much more so near the apex, which is pointed; hind margin shortly curved, rather contracted, scalloped, crenulated, and flatly excavated close to the anal angle; dorsal margin rather concave; colour whitish-brown or whitish-drab, shaded with dull reddish-umbrinous; costal region broadly blackish-umbrinous frosted from base to apex with grey; on the dorsal margin is a narrow red-black stripe shaded with red-brown from near the base to the middle, where it is widened, but cut off by two crescents, each black and white; beyond these it is continued, broader and tinged with purple-brown, to the anal angle and hind margin; first line disposed in excessively long angles, faintly reddish-brown; second line indicated by the two crescents of white, backed with black, on the dorsal margin, but above these imperceptible except for a few minute brown dots; three or four similar dots lie above the median nervure, but beyond this the ordinary pattern of markings is not present; beneath the costal stripe, toward the hind margin, are three or four tawny streaks lying between nervures, and on the costa two or three steel-grey dots; extreme hind margin edged with an undulating pale brown line; cilia purplish-white, intersected by a series of pale brown streaks interrupted by white dashes, the cilia also extended along the dorsal margin, shading from purple-brown to red-brown. Hind wings small, white at the

base, shading off to smoky reddish-brown at the hind margin, which is strongly crenulated; cilia white, dashed and shaded with dark brown. Female extremely similar.

Underside of the fore wings smoky-brown shading off to pearly-white toward the base of the dorsal margin; dorsal region also white, and hind margin to the middle; cilia white dashed with brown. Body and leg-tufts dusky-white; legs white streaked with brown.

On the wing during the latter half of May.

LARVA plump and cylindrical; when viewed sideways it appears of uniform thickness, but seen on the back it tapers behind from the tenth segment; head rather more swollen than the second segment, rounded, bright ochreous-yellow, mottled with red and spotted with black; ground colour greenish-white, pale bluish-grey, or whitish-grey; down the middle of the back is a series of broad deep yellow triangles pointing backwards, each edged on both sides by large confluent deep black spots, usually forming a somewhat C-shaped marking, which encloses another yellow spot, and below is followed by several black spots; behind all these, on each segment, is a deep green transverse spotless band; in the spiracular region there is a yellow spot on each segment except the second, besides the lateral black spots already mentioned are smaller ones on each proleg, and occasionally some fine short transverse black streaks on the sides. The forms of the black markings, composed of united spots, vary in the degree of union of these spots; each anterior spot is confluent with the posterior one below it, but does not unite transversely with the others; in one variety they resemble tadpole forms united by the tails, in another these tails are as thick as the spots and form blotched curves; and in a third these curves are so thick and confluent as to include some of the ordinary side spots, thus completely edging two sides of the yellow triangle with a blotched black border. (Adapted from Buckler.)

June and the beginning of July on the seeds and flowers of *Scrophularia nodosa*. Doubtless also on those of *S. aquatica* and *Verbascum*.

With reference to the larvæ figured, Mr. Buckler wrote to me twenty years ago: "I have four figures of as many larvæ; they vary a little, but are all very different from those of *C. verbasei* or *C. lychnitis*. The larvæ were given me by Mr. Doubleday in 1867. The only locality that I have knowledge of is in the neighbourhood of Tuddenham, where Mr. Wratislaw found them, but I think only once. It is a very rare species, certainly the rarest British one of the genus; the middle to the end of June is the time for the larva, which feeds on *Scrophularia nodosa* growing on banks in dry places. I only reared one moth; the other pupæ remained over one season after another till they dried up."

PUPA yellow-brown. Not more fully described. In an earthen cocoon.

So far as I am aware this very rare species has never been observed in this country in the moth state. All the few known British specimens have been reared from larvæ, almost all of them found in the Eastern Counties; Mr. Doubleday's larvæ, of which he sent four to Mr. Buckler and reared some himself, were, as already stated, obtained at Tuddenham, Suffolk. In 1878 several were reared by Dr. F. D. Wheeler from larvæ found by him in Norfolk, I think at no great distance from Norwich, and previously a few by the Rev. H. Williams from larvæ found near Thetford. Other records are from Lakenheath, Bury, Higham and elsewhere in Suffolk. In the collection of the late Mr. F. Bond is a series of what he considered to be this species, reared from larvæ found by him in Cambridgeshire, but they are most unsatisfactorily like *C. verbasei* (as also are most of the specimens sent from abroad under this name—hence much confusion). Mr. C. W. Dale records the present species as very rare in Dorset, but I have not seen the specimens.

Its range abroad, supposing the records really to be applicable to this species, is rather wide—Central Europe, Southern Sweden, Livonia, Northern Italy, Corsica, the Balkan Peninsula, and Southern Russia.

3. *C. lychnitis*, *Rambur*. Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Costa of the fore wings flatly arched beyond the middle; hind margin crenulated and much hollowed above the anal angle; costal region striped with reddish-umbreous, dorsal margin with red-brown, remaining space whitish-brown. Hind wings white, shading to red-brown at the hind margin.

Antennæ of the male naked, simple, purple-brown; palpi short, moderately tufted, pale drab, striped outside with blackish-brown; head thickly and bluntly tufted in front, the tufts divided into three sections by transverse channels, and barred with purplish-brown, black, red-brown, and pale drab; the portion above the antennæ also divided into tufts, red-brown, a paler tuft at the base of each antenna; collar very large, peaked and divided, pale drab with two or three extremely faint pale brown bars, and edged at the back with umbreous; shoulder-lappets very long, brownish-white dotted with dark brown; middle of thorax drab, almost filled up by the large divided top and back crests, which are black-brown with a faint frosting of white; fascicles yellowish-white; abdomen pale yellowish-brown, the basal segments abundantly clothed with yellowish-white hair-scales; dorsal ridge ornamented with two or three conspicuous black-brown crests, and behind these with a line of the same colour down the middle; lateral and anal tufts somewhat spreading. Fore wings rather sinuous, costa straight to beyond the middle, then flatly arched; apex angulated; hind margin strongly crenulated and a little curved, but below the middle suddenly and widely but rather flatly excavated; anal angle well developed; dorsal margin faintly concave, very nearly straight; colour whitish-drab slightly shaded with reddish-brown; costal region broadly blackish-umbreous throughout, faintly shaded

off below ; along the dorsal margin from near the base is a black longitudinal stripe edged with red-brown, the latter broadened in the middle and then interrupted by two curved dusky-white streaks, edged on both sides with deep red-brown, beyond which it continues to the hind margin, but encloses an elongated patch of the ground colour above the anal angle ; first line faintly indicated by a long obscure angle lying between the median and subdorsal nervures ; the second only by the curved white streaks already mentioned ; before the hind margin is a row of red-brown clouds throwing inward long points, one of which runs far into the wing ; extreme margin edged by a white line ; cilia black-brown along the base and dashed with white, but the tips white, streaked with pale grey. Hind wings rather small, hind margin much crenulated, sinuous and excavated below the apex ; white with brown nervures, and broadly shaded with brown along the apical and hind margins ; cilia white, intersected with dark brown. Female similar, but with the body shorter and stouter.

Underside of the fore wings pale smoky-brown, shading to white at the base and dorsal margin, and faintly dusted with white along the hind margin. Hind wings white, dusted over the costal region with brown, and the hind margin dappled with the same. Body, legs, and leg-tufts brownish-white.

Not variable except in size, and in this respect our largest examples seem to be inferior to some of those from abroad.

On the wing in June and July.

LARVA elongate, smooth, rounded, transversely wrinkled, sides puckered ; very slightly attenuated in front ; head shining, hardly bifid, yellow spotted with black ; ground colour whitish-green or greenish-yellow, with a transverse bright yellow band on each segment from spiracle to spiracle ; one lateral and two dorsal spots on each segment, and a pair of spots obliquely placed, and often united, below each

spiracle ; two broad black and generally united dashes on each segment succeed the dorsal spots, but on the second, third, fourth, twelfth, and thirteenth segments these dashes form black spots ; a row of black spots, one on each segment, lies above the legs and prolegs, the latter having also a black lateral spot ; there are a few ventral black spots on the fifth, sixth, eleventh, twelfth, and thirteenth segments. Very similar to that of *C. verbasci*, but the spots are fewer and differently placed. When young the ground colour is yellow. (C. Fenn.)

Mr. Buckler's figures indicate much variation in this larva ; one is as described above, another has the spots very large and much joined together, but the yellow bands narrow and pale ; a third has them broad and tinged with orange, while the spots are small and almost all separated ; a fourth has the spots few in number and reduced to mere dots, the yellow bands also narrow, and the green greatly preponderating ; while the fifth is almost wholly yellow from the breadth and extent of the bands, but is devoid of black spots except at the spiracles.

July and August on the blossoms of *Verbascum nigrum* ; feeding in bright sunshine and preferring the sunny side, eating blossoms, buds, and green seed-vessels, and avoiding the leaves until these are consumed. On the Continent feeding also on the flowers and seeds of *Verbascum lychnitis*, *V. pulcrulentum*, *V. phlomidis*, *V. austriacum*, and *V. sinuatum*.

PUPA undescribed, in a thick cocoon of earth and silk. Sometimes remaining in this stage for more than one year.

I do not find any instance of the capture of the moth in this country ; all the specimens in collections seem to have been reared from larvæ found on flowers of mullein. The extraordinary resemblance of the moths of this small section of the genus to portions of dead stick seems to secure them almost complete immunity from capture when at rest ; but, provided as they are with long tongues perfectly adapted for sucking the honey from tubular flowers, it seems remarkable that they

should never be captured on the wing. The present species appears to have been first noticed in this country (in the larva state, of course) about the year 1842, by Mr. S. Stevens, near Arundel, Sussex, and it has more recently been found in the same county near Petersfield; also at Box Hill, Surrey; near Liphook, Hants; Caversham, on the border of Oxfordshire; once near Woodchester, Gloucestershire, and rarely in Norfolk and Suffolk. Probably it is more widely distributed through the Eastern and Southern counties, but its occurrence in any other part of these Islands is extremely doubtful. Abroad its range extends through France and Germany, Corsica, and Southern and Western Russia—possibly farther—the confusion between this and previous species extending apparently to their localities. That the present species is abundantly distinct from *C. verbasci* is obvious; but its resemblance to *C. scrophulariæ* is in all respects so exceedingly close that a very strong case can be made out by those who believe in their specific identity. To my own eye there seems to be a difference in the form of the pale space down the middle of the fore wings, this in *C. scrophulariæ* being straighter and its dark edges more exactly parallel than in *C. lychnitis*, but the distinction is very slight. The difference of black marking in the larvæ is somewhat greater, and the times of appearance, in that and the imago state, appear to be different. It seems advisable, therefore, to follow the previous practice both here and abroad, and to treat them as distinct species until they are proved to be identical. The name *lychnitis* is unfortunate, since it seems to connect the insect with *Lychnis*, upon which it certainly does *not* feed; doubtless the reference is to *Verbascum lychnitis*, and Staudinger therefore points out that the name might well be *lychnitidis*.

4. **C. asteris**, *Schiff.*—Expanse $1\frac{3}{4}$ to 2 inches. Fore wings silvery-grey with a broad shaded purplish-brown stripe along the costa, and a darker purple-brown blotch at the

anal angle, curved off and continued as a narrow stripe along the dorsal margin. Hind wings smoky-white, almost wholly shaded with smoky reddish-brown.

Antennæ of the male rather long, naked, dull brown; palpi short, very broadly and densely tufted, purple-brown mixed with white; apical joint short and thick; head densely tufted with scales, which are divided into three projecting ridges by two deep cross channels below the antennæ, each ridge faintly tipped with white, that between the antennæ noticeably so; collar very large, beautifully curved, sweeping back in the middle to a long point or peak, silvery-grey, three times barred with brown in different shades, and edged at the back with black-brown; shoulder-lappets very large and long, silvery-white shaded with pale brown toward the shoulders and sprinkled with a few dark brown dots; remainder of the thorax reddish-brown, top crest concealed by the tall collar, back crest rather invaded by the long shoulder-lappets, black-brown tipped faintly with white; fascicles very long and curving over, brownish-white; abdomen long and tapering, dull grey-brown obscured by abundant white hair-scales; on the dorsal ridge are two conspicuous erect black-brown crests, followed by similar but more prostrate tufts; lateral tufts dusky-white; anal tuft long and somewhat forked, greyish-white. Fore wings very long, narrow; costa thickly ribbed, straight or even a little hollowed near the base, strongly arched toward the apex, which is angulated; hind margin very oblique, nearly straight, faintly crenulated; dorsal margin almost straight; colour silvery-grey, but the costal region is completely occupied by a broad shaded purple-brown longitudinal stripe, the dorsal margin by another, much narrower, but suddenly bent up beyond the middle, and cut off by a slender upright white crescent edged with black; beyond this is a large purple-brown cloud occupying the space over the anal angle, and containing a hooked black line and two or three small white streaks; sometimes the ordinary first line is suggested by

long streaks of excessive faintness just perceptibly forming angles, but these are usually absent; the white crescent already mentioned is the only distinctly visible portion of the second line, and neither is indicated at all in the costal brown area; orbicular stigma suggested by short upright chocolate streaks, between which is a faint fulvous cloud; base of the reniform only outlined by a slender horizontal chocolate line and three similar dots; two or three extremely faint whitish dots are just visible on the costal arch, and below the apex are two or three pale longitudinal streaks between the nervures; parallel with these is, in some individuals, a slender black streak; extreme hind margin edged by a pale brown line which is preceded by chocolate lunules; cilia grey dashed with purple-brown. Hind wings short, rounded, smoky brownish-white shading to dark smoky-brown along the hind margin; nervures dark purple-brown; cilia white. Female similar, but with a stouter abdomen.

Underside of the fore wings very dark smoky-grey, almost smoky-black, but the basal portion of the dorsal region pearly-white. Hind wings white, broadly clouded along the costal and apical regions, and narrowly along the hind margin, with smoky-brown; nervures rather darker. Body pale grey; legs dull brown with paler tufts, but the front of the tibiæ greyish-white with brown lines.

Hardly variable except that specimens obtained or reared from the salt-marshes of the coast seem to be of a purplish grey, and those from inland localities rather more of a reddish-grey.

On the wing in June and July.

LARVA elongate, slightly attenuated behind; skin rather polished; head rounded, bluish-green spotted or dusted with black; a slight projection on each side of the mouth; body bright green; dorsal line broad, yellow; subdorsal line and another below it pale green; spiracular line broad, yellow, with the lower half white; all these lines distinctly edged

on both sides with black; a stripe paler than the ground colour lies between the subdorsal and the line below it; spiracles white, edged with black.

Or, head purplish spotted with black; colour pale greenish-grey with a purplish tinge; dorsal line very bright yellow; two subdorsal lines yellow, spiracular line as in the type; sides suffused with purplish-red; between the subdorsal and spiracular lines are two parallel black threads; undersurface whitish-grey down the middle, purplish-red at the sides. (C. Fenn.)

July, August, and September on *Solidago virgaurea* and *Aster tripolium*, preferring the blossoms, feeding both by day and by night. Also occasionally upon China-aster (*Callistephus chinensis*) in gardens.

PUPA short, fusiform, with a projection in front of the body at the ends of the limb-cases, and a slight protuberance at each side of the head above the eyes; rather soft and semi-transparent, orange-brown; incisions of the segments and dorsal line darker; spiracles black, and there is a small black mark at the base of each wing-case; anal extremity dark brown. Subterranean, in a thick cocoon. (C. Fenn.)

This species also is far more frequently found in the larva than in the imago state, yet the moth comes occasionally to flowers at dusk, to honeysuckle-blossom quite eagerly, and I have taken it flying over white tobacco, and other flowers such as red valerian (*Centranthus ruber*). It also comes more rarely to a strong light. Probably to be found, if searched for, in most parts of England in which the golden-rod is plentiful, and on the more muddy seashores where *Aster tripolium* abounds, but evidence is wanting. It is, however, not very uncommon in Norfolk, Suffolk, Essex, Kent, Surrey, Sussex, and Hants, but is rare in Dorset, and apparently not noticed in the extreme south-west, yet is known to occur in Herefordshire, and at Grange and Wither-slack in North Lancashire, as well as in North Wales. So

far as I know these districts indicate the limits of its range in these Islands. Abroad it is found throughout Central Europe, Southern Sweden, Livonia, Southern Russia, and the mountainous districts of Central Asia.

5. **C. gnaphalii**, *Hüb.*—Expanse $1\frac{1}{2}$ inch. Fore wings not very long, pointed; silvery-grey; a black streak from the base; middle area and apex clouded with purplish-umbreous with a faint chocolate flush; upper stigmata paler; in the hinder area are several chocolate-black streaks; hind margin dotted with black. Hind wings black-brown.

Antennæ of the male simple, naked, light brown, white at the back; palpi extremely short, dark purple-brown, apical joint short and black; eyelashes very long, black-brown; head thickly scaled, divided into prominent tufts by two cross-channels, purple-black dusted with white; at the base of each antenna is a white tuft; collar very large, peaked, silvery-grey, but barred in front with black, and beneath this shaded with light-brown; shoulder-lappets long, silvery-grey; remainder of thorax brown-black streaked with silvery-grey, top crest concealed by the peaked collar, back crest deep black; fascicles brownish-white; abdomen rather long, pale smoky-brown shaded with grey hair-scales; dorsal crests black, that on the basal segment very small, the following two larger, the fourth prostrate; lateral and anal tufts grey, the latter pointed and faintly divided. Fore wings rather pointed, moderately narrow; costa straight to beyond the middle, thence arched; apex bluntly angulated; hind margin oblique, crenulated, very faintly curved; dorsal margin nearly straight; silvery-grey much clouded with black-brown and having a chocolate flush; from the middle of the base, below the median nervure, is a long thin black streak unusually straight; first line double, black-brown, much angulated, and having a very long point running almost to the base of the dorsal margin; second line only commenced on the dorsal margin as a slender black crescent edged in its hollow with

white and backed with dark brown, the rest of its course scarcely suggested; orbicular stigma large, pale brown, almost double, or shaped like a cottage loaf, each half containing a dark brown cloud; reniform stigma larger and very similar, pale grey-brown edged with black and containing small dark brown clouds; central area of the wing around these stigmata, and between the two lines, clouded with purplish-umbrinous, a shading of the same being continued obliquely toward the apex of the wing; a row of similar small clouds lies before the hind margin, that nearest the anal angle being much the largest, and also enclosing a black streak; another black streak runs inward from one of the smaller clouds in the middle of the row, and a third lies before the apex; above this last, on the costal margin, are three white dots; portions of some of the nervures, with their tips, are streaked with black; hind margin and cilia very charmingly laced, the former being edged with black lunules separated by whitish dashes, the latter pale grey intersected with brown lines. Hind wings rounded, black-brown, rather paler at the base, cilia white. Female very similar.

Underside of the fore wings black-brown, basal portion of dorsal margin pearly-white; cilia dusted with white. Hind wings black-brown beyond the middle, the basal half smoky-white, dusted toward the costa with dark brown; central spot black; cilia white. Body pale brownish-grey; leg-tufts pale brown; legs brown, the front tibiae whitish-grey.

Apparently not variable.

On the wing in June and the beginning of July.

LARVA of moderate stoutness, cylindrical, though tapering a little in the last three segments to the extremity; head rounded and scarcely smaller than the second segment, green, with groups of very minute black dots, and the ocelli black; skin entirely without gloss; ground colour rather deep green, inclining a little to olive-green, and thickly freckled with pale yellow atoms; dorsal stripe complete, very broad, dark

purplish-brown, widest in the middle segments; down its centre is a series of diamond and roundish oval shapes faintly outlined in black, two on each segment, the diamond in front; an equally fine undulating black line runs on either side of them so as to form another series of diamonds along the segmental divisions, a little paler than those of the central line; subdorsal line a faint freckled line of purplish-brown, followed by two others, very faint, sinuous and interrupted so as to be but little noticeable; spiracular line a longitudinal thread of pale yellow freckles becoming whitish as it approaches the head, on which it continues to the side of the mouth; spiracles green, outlined with black, each situated in a purplish-brown blotch or slash placed obliquely along the side and pointing upwards and forwards; legs and prolegs green, the ventral prolegs each with a purplish-brown spot on the side; back of the anal pair similar, and their basal hooks brown; ventral surface green freckled with pale yellow in seven longitudinal lines, the middle ones the broadest and palest. It has a rough mealy look which assimilates well with that of the stem of the plant. As it reaches quite full growth the dorsal stripe becomes paler, and the green and pale yellow freckles show more plainly through it. (Condensed from Buckler.)

July, August, and September on *Solidago virgaurea* (golden-rod), usually feeding at night, lying closely during the day, head downwards, on the lower part of a leaf, or on the stem, and exceedingly difficult to find. Moreover, when found it is terribly infected with ichneumon parasites.

PUPA yellow-brown, hinder portion flattened to a broad cremaster. (Hofmann.) In an earthen cocoon.

We know little or nothing of the habits of this species in the moth state. It is asserted that specimens have been taken at rest in the daytime in Sussex, but whether sitting upon plants, or on railings or gates, or *how*, has not been specified. One example was undoubtedly taken, in 1892.

flying at dusk, about flowers, on a sunny terrace at Witley, Surrey, by Miss Ada Evans; it is now in the collection of Mr. W. H. B. Fletcher. No other captures have come under my notice, except of the larva. In this state it has been found at Tunbridge Wells, Sevenoaks, Darenth Wood, and Deal, Kent; at Tilgate, Abbots Wood, and Hayward's Heath, Sussex; near Horndean, Hants; Birch Wood and Witley, Surrey; and Epping Forest, Essex; but outside these five counties I have no knowledge of its presence in these Islands.

Abroad it has a considerable range: France, Switzerland, Central and Southern Germany, Hungary, Finland, Russia, and the mountainous regions of Central Asia.

6. **C. absynthii**, *L.* — Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings narrow at the base, greyish-white with a purplish flush; a double black bar before and another just beyond the middle; stigmata indicated by round black dots in pairs; hind margin dotted with black. Hind wings white faintly shaded behind with smoky-brown.

Antennæ of the male rather thick, naked, brown in front, white at the back; palpi very short and blunt, white mixed with dark brown; head thickly tufted, pale grey, barred three times and shaded with black; at the base of each antenna is a large loose white tuft; collar very long and strongly peaked, pale grey, but its base dark brown, edged with a black bar, which also curves up the middle to a point; above this twice faintly barred with pale brown, and edged at the back with smoky-brown; shoulder-lappets large and long, greyish-white edged with pale brown and dotted with dark brown; central portion of the thorax light brown; top crest concealed by the peak of the collar; back crest black, tipped with white; fascicles very abundant, white; abdomen pale brown dusted with black, but plentifully covered with long white hair-scales; on the first three segments are large black crests; lateral tufts small, white;

anal tuft long and narrow but rather forked, brownish-white. Fore wings rather narrow but broader behind, of singular beauty; costa straight to beyond the middle, then much arched; apex bluntly angulated; hind margin oblique, almost straight; dorsal margin very straight; colour silvery-white flushed with purple, very much marbled with black and black-brown; basal line indicated by short black streaks and spots; first line a double series of deep black clouded crescents which form a conspicuous double bar across the wing; second line greyish-white, arising on the dorsal margin as a twice angulated streak edged on each side with black-brown clouding, hardly perceptible in the middle portion, though faintly edged in the same manner, more distinct again toward the costa; orbicular stigma curiously indicated as a white space enclosing two black spots placed perpendicularly, and margined at the corners by four more; reniform stigma more obscurely white but similarly centred and cornered with black spots; between these stigmata is a series of deep black clouds, forming a central stripe which unites with the black clouding before the dorsal part of the second line, and so takes the place of a central shade; space outside this dappled with faint elongated cloudy-brown streaks, more blackened toward the apex; hind margin edged with a row of large black dots; cilia silvery-white, twice intersected by pale purplish-grey lines. Hind wings rounded, but with a slight angle in the hind margin; white at the base, shading off to smoky-brown at the apex and behind; nervures pale brown; cilia white. Female very similar but with a shorter abdomen.

Underside of the fore wings pale smoky-grey, dotted on the costa and hind margin with white. Hind wings white, shaded with smoky-grey along the apical and hind-marginal regions; cilia white. Body and legs whitish-grey.

Usually very constant in colour and markings, merely varying in the extent of black spotting and bands; but in the collection of Colonel Partridge is an ashy-white example

having all the markings indistinct. It was obtained at the Isle of Portland.

On the wing in July.

LARVA stout, with the segmental folds deeply indented; head greyish freckled with green, rather narrower than the second segment, which is pale grey, mottled with brown; ground colour green; on each segment and on either side of the dorsal line are four tubercles, arranged transversely on the second, third, and fourth segments, and in a trapezium on the others: there are also two in the spiracular line on each segment; all these emit a single bristle; dorsal line pale grey, widened toward the hinder half of each segment. Each tubercle is in a brownish area, and the two front ones on each segment are connected with the hinder pair on the preceding segment by an indistinct green stripe rather darker than the ground colour. The spiracles are pale, with a dark ring, and are very inconspicuous. There is a pure white stripe beginning at the front of each segment in the spiracular line, and extending obliquely to the claspers (prolegs), which, with the legs, are white and resemble porcelain. The ventral surface is streaked and mottled indistinctly with white. (W. F. H. Blandford.)

August and the beginning of September on *Artemisia absinthium* (wormwood) and occasionally on *A. vulgaris*, feeding only upon the flowers, seeds, and buds; eating greedily in the sunshine—which appears to be essential to its health—but when the weather is wet leaving the plants to hide on or under the ground; in fine weather, especially towards dusk, it climbs up, and when not feeding it rests on the stems among the flowers, and from its colour and markings resembles them so accurately as to be discovered much more easily by the touch than by sight.

PUPA apparently undescribed, in a thick tough cocoon of earth and silk. In this state through the winter.

The habits of this species in the imago state appear to be unknown. Although the larva is to be found in some plenty in very restricted localities, the moth seems hardly ever to be seen at large either in the daytime or at night. The only record of its capture which has come under my notice is that of a single specimen "taken in a garden at Rathowen, Westmeath, by Mrs. Battersby." But the larva is recorded by Donovan as having been found upon wormwood in or about 1780 in *Bunhill Fields*, which is now a densely populated portion of London! Its usual haunts, however, are on rocky portions of the sea-coast counties, especially in the South-West and West. The only exception that I know of is a very restricted locality on the coast of Suffolk. It is not rare in the Isle of Wight and in some seasons is plentiful at the Isle of Portland, though scarce on other parts of the Dorset coast. In Devon sometimes abundant at Plymouth, Dartmouth, and other parts of the South coast; also on the North coast, and on that of Somerset; in Cornwall it appears to be less frequent. In South Wales I have found it freely in the farm-yards and waste places of the farms nearest the coast cliffs of Pembrokeshire; in North Wales it is recorded from Barmouth and Dolgelly. With the exception of the single specimen already alluded to as taken in Westmeath, Ireland, this is the extent of its known range in these Islands. Abroad it is found through France, Germany, Switzerland, Hungary, South Sweden, Livonia, Bulgaria, large portions of Russia, and the mountainous regions of Central Asia.

7. **C. abrotani**, *Fab.*; **artemesiæ**, *Staud. Cat.*—
Expanse $1\frac{1}{2}$ inch. Fore wings narrow and pointed; pale silvery-grey, with a browner shading; transverse lines angulated and zigzagged; upper stigmata pale, edged with black. Hind wings yellowish-white clouded with light smoky-brown.

Antennæ of the male simple, naked, light brown; palpi

short and thickly tufted, mixed black and white; head tufted and barred, lower portion black dusted with white, then barred with pale brown, and between the antennæ with white, above this black dusted with white; tufts beneath the antennæ very large, dusky-white; collar moderately large and rather peaked, brownish-white, barred in front with black, behind this faintly with grey and white, the back margin broadly grey-brown; rest of thorax grey-brown, the shoulder-lappets streaked with white; crests obscure, the top one covered by the peak of the collar, that at the back black-brown and rather prostrate; fascicles dirty white; abdomen long, pale brown, more reddish-brown behind; basal segment ornamented with a black dorsal crest, the following segments with very obscure similar prostrate tufts; lateral tufts small and obscure, the anal long, silky, pale brown. Fore wings narrow; costa straight to near the apex, where it is flatly arched; tip angulated; hind margin very oblique, gently curved; dorsal margin nearly straight; colour pale brownish-grey; basal line only indicated by very slender streaks close to the costa; first line black-brown, cloudy but distinct, forming very long angles; second line similar and nearly complete, but in shorter angles; a faint series of brown clouds seems to suggest a subterminal line; orbicular stigma large, pale grey, edged on each side with black, and divided with pale brown; reniform stigma pale grey clouded with brown and completely edged with black; region between the stigmata and near the transverse lines clouded with brown; hind margin dotted with pale brown spots which are edged behind with black lunules; cilia greyish-white dusted with brown. Hind wings somewhat rounded, though having a faint hollow below the apex; white at the base, shading off to pale brown behind; nervures rather darker brown; cilia white. Female very similar, but the body shorter.

Underside of the fore wings pale smoky-grey edged with paler on the costa and hind margin. Hind wings white,

shaded along the hind margin with smoky-brown; cilia white. Body and legs greyish-brown.

Apparently not variable.

On the wing in June and July.

LARVA green with darker green divisions to the segments; dorsal line slender, white; on each segment are eight red tubercles, except on the last where there are two; among these, on the second and fourth segments, is a shorter yellowish point; above the feet is a broad undulating yellow longitudinal stripe interrupted on each segment; spiracles white, ringed with black; head brown edged behind with black, and having a pale-edged triangle on the forehead; undersurface pale green with two slender longitudinal lines, which are red-brown on the fourth and fifth segments, on the remainder dark green. (Hofmann.)

August and September on *Artemisia campestris*, *A. abrotanum*, and *A. absinthium*.

PUPA yellowish with the front greenish. (Hofmann.)

Nothing is known in these Islands of the habits of this species, except that two specimens found upon a fence in Devonshire, but which I have had no opportunity of seeing, are said to belong to it. On the Continent it is found in sandy districts, sometimes commonly. I greatly hesitate to include it here as a British species, yet have little doubt of its—very rare—occurrence. One specimen was found, unrecognised, in the series of *A. absynthii* in the collection of the late Mr. Edwin Shepherd; another in that of the late Mr. Edwin Brown of Burton-on-Trent; and a third in another English collection; all three were purchased at different sales by Dr. Mason. When looking through the collection of the late Rev. H. Burney, after his death, I found another example in his series of *A. absynthii*, certainly overlooked by him. Mr. Burney collected larvæ of *A. absynthii* in plenty in the north of Pembrokeshire, and

I believe also in Devonshire; and there is not, in my opinion, any doubt that his and all the three specimens previously mentioned were reared from larvæ accidentally collected along with those of the other species. *C. abrotani* is so well known abroad that it is altogether unlikely to have been introduced among *A. absynthii*. In future a larva on *Artemisia* having red dorsal tubercles should be regarded with peculiar interest.

Abroad its range is through Germany, Hungary, Switzerland, South Sweden, Poland, Central and Southern Russia, and the mountainous regions of Central Asia.

8. **C. chamomillæ**, *Schiff.*—Expanse $1\frac{1}{2}$ to $1\frac{2}{3}$ inch. Fore wings narrow, pointed, smoky-grey or brown-grey, usually clouded with black; nervures black; a long slender basal line, and two or three short lines between the middle and hind margin, black. Hind wings dark smoky-brown.

Antennæ of the male long, simple, naked, brown; palpi short, very broadly tufted, black-brown mixed with drab, apical joint nipple-like; tongue very large and long; head densely tufted with scales which are divided across by narrow channels into flat compressed ridges, black-brown tipped with grey; collar large and conspicuously peaked, pale grey barred in front with a red-brown cross-stripe which throws up a point in the middle, above this obscurely barred with brown; remainder of thorax grey except that, obscured by the long grey scales of the collar and shoulder-lappets, are narrow black-brown crests; fascicles dusky-white; abdomen very long, pale grey, the basal segments covered with dusky-white hair-scales, and having on the dorsal ridge two small crests tipped with brown-black; lateral tufts obscure; anal tuft very long and forked. Fore wings narrow; costa straight or faintly hollowed to beyond the middle, thence flatly arched; apex angulated; hind margin very oblique, almost straight, and faintly crenulated; dorsal margin straight; colour dark smoky-grey faintly tinged along the costal and dorsal margins

with brown ; nervures all darker grey and blackened toward the tips ; from the middle of the base a long and very thin black line lies below the median nervure, and another, shorter, close to the dorsal margin ; first line grey-black, hardly noticeable from being disposed in oblique lines, forming angles so long that they reach the middle of the wing ; second line of the same colour, only just perceptible, and disposed in disconnected curves between the nervures ; toward the hind margin are two thin black lines lying between nervures, one above the anal angle, the other above the middle ; places of the orbicular and reniform stigmata, or the reniform only, just indicated by a rather paler grey or brownish-grey unmargined cloudy spot, but very frequently these and all other markings in the middle are obscured by smoky-black clouding ; cilia grey divided by darker dashes proceeding from the nervures. Hind wings rather narrow with the hind margin sinuous ; pale smoky-grey with an obscure hinder band of darker grey-brown ; nervures dark brown ; cilia white. Female similar but with darker hind wings and stouter body.

Underside of the fore wings dark smoky-grey, costa and hind margin paler grey. Hind wings smoky-white, dusted along the costal area and clouded behind with grey-brown ; nervures darker. Body and leg-tufts very pale purplish-drab ; tibiæ grey barred with brown.

Variable in depth of colour, especially in the intensity of the central clouding of the fore wings, which in some specimens is sooty-black, and graduates in every shade to the normal smoky-grey, and to paler ; occasional examples being rather pale dull grey with all the nervures visibly darker, and having brownish dashes between them toward the hinder area.

On the wing at the end of April and in May, or occasionally June. In the year 1856 several were captured at Plymouth even in July. On the other hand the very small amount of protection obtained by keeping it in a cold portion

of a house will cause it to emerge from pupa in March, and by a warmer temperature it has been brought out in January. Yet there is no reason to suppose more than a single generation in the year.

LARVA plump, the segments beyond the middle thickened, yet the divisions not deep nor well marked; head rather retractile, rounded in front, pale horn colour, striped down the face with pale brown; anal segment rather humped but sloping obliquely off; sides wrinkled and a little inflated; colour greenish-white, shining like a piece of porcelain; down the back is a double row of oblique olive-brown bars, only prevented from meeting by the dorsal vessel, and thus forming incomplete V-marks; below these on each side is a single row of similar oblique streaks, producing the effect of zigzag markings all over the dorsal portion of the larva, except that the second segment is devoid of them, and longitudinally barred all round with green and white; legs brownish-white; prolegs swollen and fatty-looking; undersurface also shining yellowish-green.

Or the oblique streaks on each side of the dorsal line united by red-brown streaks into irregular zigzags which almost enclose dorsal diamond shapes; between these and the lateral streaks is an irregular dark red subdorsal line narrowed and broadened on every segment; beneath the lateral oblique streaks is an undulating line of pale red and greyish-green, the oblique streaks themselves being darker or tinged with red, and the whole pattern more complex than in the previous variety. Described from examples forwarded from Salop by Mr. F. C. Woodforde.

June and July, sometimes August, indeed it is as uncertain as the moth, and has been found at the end of *April*! On *Pyrethrum inodorum*, *P. maritimum*, *Matricaria chamomilla*, and *Anthemis cotula*, feeding in the bright sunshine, and also at dusk and at night, more especially upon the flowers and seeds. In confinement it devours most ravenously the

blossoms of the Marguerite (*Chrysanthemum frutescens*), and if the weather is bright feeds up with great rapidity. Very sudden and hasty, almost jerky or nervous in its movements, but if alarmed it becomes instantaneously quite still, and so remains for some little time. Mr. Woodforde says: "I find that the best time to take them is between sunset and dusk, when they come up to feed, though they may be found in the daytime by examining under the flower-heads where the flowers are bitten. A favourite position is grasping the stem with the hinder prolegs, and stretching over the top of the flower to eat the centre of the eye, getting the head right into it. Another habit is to bite off the heads of *Pyrethrum inodorum* just where they join the stalk or half an inch below, and drop the flower-heads to the ground; it gives the plant a peculiar look, the long straight stalks sticking out with nothing upon the ends. Those which I found feeding upon this plant were all green or whitish-green; of three found upon *Matricaria* two were reddish; since feeding on *Matricaria* several of the smaller whitish-green larvæ have become reddish. The common colour, however, is green, and they closely resemble green ears of wheat; this I think is remarkable, as they are generally found in wheat fields, although wheat is not their food plant."

PUPA extremely thin-skinned; end of the tongue contained in a long nipple-like case projecting in front of the abdomen; otherwise of the usual form, almost devoid of sculpture and very glossy; yellow-brown, spiracles distinct, black; cremaster projecting, flattened and bluntly rounded, very smooth and shining, and without a trace of spines or bristles. Underground at some depth, in an extremely thick, even massive, cocoon of earth and silk. In this state through the winter.

The moth loves to sit in the daytime upon the top of a railing, gate, post, or even wall or iron rail, but especially on a park fence, with its wings clasped closely down; and

with its peaked thorax, crests, and forked anal tufts, is quite sufficiently like a bit of rough grey wood to deceive any but the keenest eye. At dusk it flies to flowers—*Lychnis dioica*, *L. respertina*, *Narcissus poeticus*, and others—and has been known later at night to come to light, but quite disregards the attraction of sugar. Never seen in any plenty in the moth state, but sometimes, by close searching, found commonly as a larva.

Widely spread in England, apparently occurring in all the Southern, Eastern, and Western Counties to Salop and Lancashire, though rarely in some of them; also rarely in Warwickshire, North Staffordshire, and Derbyshire; in Yorkshire, and formerly in Durham, though it seems to have disappeared from the Hartlepool district for twenty-five years; doubtless still existent close to the London suburbs, since I met with a specimen on a fence in Camberwell a few years ago. Probably throughout South Wales, since it occurred rarely at Pembroke. In Scotland it has been recorded as moderately common at Dunbar, and is found occasionally throughout the Tweed, Forth, and Clyde districts and in Perthshire. In Ireland apparently confined to the coast, in the counties of Dublin, Wicklow, Galway, and Sligo. Abroad it has an extensive range through Central and Southern Europe, Asia Minor, Syria, Morocco, Egypt, and Madeira.

9. **C. umbratica**, *L.*—Expanse $1\frac{3}{4}$ to $2\frac{1}{4}$ inches. Fore wings long, pointed, rather broad behind; pale grey shaded along the dorsal area with smoky-black, and often tinged toward the costa with brown; nervures dark grey; slender black streaks at the base and hinder area; stigmata indicated by dots. Hind wings white with dark nervures, often darker in the female.

Antennæ of the male long, stout, simple, naked, pale grey; palpi short, broadly tufted, purple-brown mixed with white, apical joint rather pointed; tongue very long; head

densely tufted, the scales divided by channels into three ridges, dark grey tipped with white; collar large and peaked, whitish-grey, but with the basal area light brown, edged above by a slender black bar, which is much pointed up in the middle; above this are three faint brownish-grey transverse stripes; shoulder-lappets greyish-white; middle of the thorax pale brown, the crests blacker but much obscured by long grey scales; fascicles white; abdomen very long, whitish-grey, basal segments covered with long white hair-scales, half hidden by which are two small dusky-brown dorsal crests, followed in some instances by similar cloudy spots along the dorsal ridge; lateral tufts compressed, obscure; anal tuft long and rather loose, faintly divided, greyish-white. Fore wings long, narrow at the base; costa straight to the middle, thence considerably arched; apex angulated; hind margin almost straight, very oblique, and obscurely crenulated; dorsal margin faintly hollowed beyond the middle; colour whitish-grey much obscured by clouding of darker grey on the costal and dorsal margins and the nervures, and having on the costal half of the wing, from the middle outward, a shade of pale brown; arising at the middle of the base is a long and thin black streak lying below the median nervure; it is interrupted at the first line, but then continued to the middle of the wing; first line obscure, grey-white, edged on both sides with grey, disposed in very long angles; second line similar though in much shorter angles, incomplete, visible only near the two margins; the positions of the two upper stigmata are faintly browner, and their margins seem to be indicated obscurely by black dots, and that of the reniform by a curved black streak; toward the hinder area of the wing are two longitudinal hair-like black lines, one above the anal angle, the other above the middle, and the extreme hind margin is edged with short black dashes; cilia pale brownish-grey. Hind wings pearly-white; nervures dark brown; hind margin slenderly clouded with the same colour, and the dorsal margin with light

brown; cilia white. Female decidedly larger, with broader fore wings rather darker in colour; hind wings dark smoky-brown with the base paler; body shorter and thicker.

Underside of the fore wings smoky grey-brown; discal cell full of long, prostrate, dusky hair-scales; base of the dorsal margin pearly-white. Hind wings white, dusted along the costa with pale brown; nervures similar; central spot smoky-brown. Body and leg-tufts brownish-white; legs grey-white.

Variable in size and also in the depth and degree of dark shading upon the fore wings, which becomes in the west of Ireland and in Scotland rather of a blackish-grey.

On the wing in June and July.

LARVA moderately stout, tapering but little at either end, except the last segment, which is rather elongated and slopes off at an obtuse angle; head dull black; a dull blackish-brown plate on the second segment having three small spots of the ground colour on its front edge; general colour bright ochreous-yellow, with an elaborate blackish-brown raised and granulated arabesque pattern of curves and angles on the back, the sides equally intricate, but linear and wavy in character; dorsal stripe represented by double triangular spaces of the ground colour at the segmental divisions, and on the last segment as a central stripe; subdorsal lines indicated by very thin undulated lines of the ground colour, and on the anal segment abruptly widening into a broad stripe tapering to a point at the extremity; raised spots and spiracles black, as also are the legs and prolegs, the latter having a ring of white above their extremities.

Or, ground colour brilliant orange-ochreous, visible in spots at the segmental divisions along the middle of the back and in narrow streaks along the subdorsal region, a much interrupted line along the spiracles, and a row of spots and blotches on the side just above the legs, the largest above the

anterior legs; three broad stripes meeting at the end of the anal flap; all the rest blackish.

Or, ground colour dull brownish-ochreous, visible as dorsal, sub-dorsal, and lateral stripes, on the third and fourth segments with little interruptions, but on other segments only the faintest traces of them, except the anal, which is marked similarly to those previously described, and the dorsal stripe merely as a triangular spot at the end of the intermediate segments; all the rest of the body dull brownish-black, and each spiracle placed in a swelling blotch of intense and rather shining black. (W. Buckler.)

End of July to the beginning of September on various species of sow-thistle and wild lettuce—*Sonchus arvensis*, *S. oleraceus*, *Lactuca virosa*, *L. sativa*—feeding at night, hiding itself by day under the lower leaves. When disturbed it is said to fall to the ground and twist its head to right and left in an angry manner, sometimes stretching it out in a leech-like fashion.

PUPA rather elongated, a little concave in front from the projection of the tongue-case, which is large and distinctly curled; wing- and limb-covers extremely glossy and without sculpture; dorsal and abdominal segments also glossy but not equally brilliant, hardly showing a trace of sculpture, but having a faintly raised band at the back of each; anal segment suddenly rounded off; cremaster a long and broad smooth spike without a trace of bristles; general colour red-brown; spiracles distinct, black; cremaster dark brown. In a strong tough cocoon of silk mixed with a little sand, not so thick as in other species. In confinement Mr. Buckler found that no proper cocoon was made, but only a loose silken hammock among the leaves and buds of its food-plant. This must have been quite abnormal, since the species passes the winter in this state.

The moth sits, in the daytime, upon fences, rails, gates, and similar objects, to which its appearance closely assimilates

it; at dusk it comes freely and conspicuously to blossoms of honeysuckle, turn-cap lily, *Rhododendron*, *Silene inflata*, *Lychnis vespertina*, and *L. dioica*; Sweet William (*Dianthus barbatus*), thistle (*Carduus heterophyllus*), and other flowering plants, indeed its habits in this respect are in direct contrast to those of our other species of *Cucullia*, since in it the vast majority of specimens in collections are captured on the wing. When feeding thus at honeysuckle blossom it is often mistaken, from its size and bold flight, for a hawk-moth. Occasionally it is attracted by a strong light, but, I think, never by sugar. Common through the southern half of England and sometimes abundant; more local and far less common throughout the northern half, and common in Wales to Pembrokeshire, very so in the northern portion. In Scotland it again becomes plentiful in some districts, and is found throughout the country to the Orkneys. In Ireland everywhere common. Abroad it ranges through Central Europe, the temperate portions of Northern Europe, and some parts of the South and East; also Asia Minor, Armenia, and Northern Africa.

Genus 86. **PLUSIA.**

Antennæ nearly naked, sometimes notched, in other cases simple; palpi ascending, of moderate length, in some species re-curved; tongue very long; eyes naked, having front and back lashes; thorax strongly crested; abdomen ornamented with several crests; fore wings somewhat triangular, pointed, glossy, and usually embellished with metallic golden or silvery markings; anal angle prominent; hind wings broad, plain; cross-bar long, slender, angulated; vein 5 arising below the middle and rather curved.

LARVÆ devoid of the usual two anterior pairs of prolegs, attenuated towards the head. On herbaceous plants.

PUPÆ provided with a projecting tongue-case; in a silken cocoon, which is often spun up among leaves.

We have eleven species, most of which are easy of recognition :

- A. Fore wings dull brown with two very broad golden bands. *P. chrysis*.
- A². Fore wings obliquely and alternately striped with purplish-pink and olive-green. *P. illustris*.
- A³. Fore wings dark purple-brown with one gold spot.
- B. The gold spot large, rather squared, placed beyond the middle. *P. chryson*.
- B². The gold spot rather pear-shaped, in the middle of the wing. *P. bractea*.
- A⁴. Fore wings rich chocolate, or light purple-brown.
- C. Fore wings almost suffused with pale gold, and having a brighter, doubly-ringed central spot. *P. moneta*.
- C². Three rich golden elongated spots on the chocolate surface. *P. festuca*.
- C³. A central **y**-like golden mark, very often broken.
- D. A large squared chocolate cloud on the dorsal margin includes the gold **y**. *P. iota*.
- D. The whole surface richly rippled with chocolate and golden purple. *P. pulchrina*.
- A⁵. Fore wings violet-grey, purple-grey, or greyish-brown, with the central mark silvery.
- E. The colour purple-grey to grey-black, very smooth, the spot a very perfectly formed **y**. *P. gamma*.
- E². The colour violet-grey to violet-black; the spot **U**-shaped with a round spot beneath. *P. interrogationis*.
- E³. The colour grey-brown or pale purplish-brown, dull, the spot an obscure **y**, abdomen with ochreous lateral tufts. *P. ni*.

1. **P. chryson**, *Esp.*; **orichalcea**, *Hüb., Stainton*.—Expanse $1\frac{3}{4}$ inch. Fore wings broad, pointed, rich dark purple-brown with a large somewhat squared golden blotch beyond the middle; hind wings pale brown with darker nervures.

Antennæ of the male stout, simple, minutely ciliated,

almost naked. golden-brown; palpi short, thickly scaled, upraised, dull purple, apical joint very small; eyes dull black dotted with velvety black; head densely covered with erect orange-brown scales, divided by a slight cross-channel below the antennæ: at the base of each of the latter is a small white tuft; collar rich orange-brown edged with deep sienna-brown; remainder of thorax dark sienna-brown or purplish-brown. with a very large erect undivided back crest, paler except at the apex; fascicles yellowish-white; abdomen dull pale ochreous covered with paler hair-scales, but having upon the back of the basal segment a short but dense mass of raised deep sienna-brown scales, and on the second a tall dense similar crest, while the third has a prostrate tuft tinged with the same colour, and the rest are shaded therewith upon the dorsal ridge, as also is the upper portion of the long anal tuft; lateral tufts rather thick. Fore wings broad but gracefully pointed; costa gently curved; apex angulated and a little produced; hind margin beneath it faintly hollowed, then filled out and a little expanded; anal angle produced and rather sharply angulated, and the dorsal margin distinctly concave; colour rich velvety purple-brown, deepest in the middle, and having in the costal half, beyond the middle, a large brilliantly golden blotch which is twice curved at its inner edge and minutely scalloped at the outer: basal line widely duplicated but partial and indistinct, hardly visible beyond the costal cell; first line slender, rather oblique, several times bent; both deep chocolate; second line of the same colour, very sinuous and crossing neatly the golden blotch; subterminal line only perceptible as the irregular undulating inner edge of a paler hind-marginal space; stigmata not indicated; cilia faintly crenulated, smooth soft chocolate dappled with paler. Hind wings not large, rounded behind; pale purplish-brown with a golden gloss, rather paler in the central area; cilia also paler, especially so at the tips. Female accurately similar except that the body is rather stouter.

Underside of fore wings dull orange-brown except the middle portion, which is broadly clouded with smoky-black between the nervures; beyond the middle is a slender curved black-brown transverse line. Hind wings pale orange-ochreous dusted with brown; central spot small, black-brown; beyond it is a slender transverse curved brown line followed by a broader, fainter one near the hind margin. Body and legs dull yellow; upper half of the front tibiae thickly tufted with frosted purple scales.

On the wing in July and August.

LARVA green; head rounded, dark green; dorsal line darker green, enclosed to the twelfth segment between two fine white lines; from the fourth to the twelfth segment the sides are ornamented with oblique white lines from the dorsal to the spiracular line, which last is dark-green with a whitish edging below; on the second, third and anal segments are five irregular white lines which unite in front; spiracles small, white, but the last is larger and more conspicuous; undersurface and prolegs green, minutely dotted with white; legs blackish-green. When extended tapering off in front, but these segments extremely retractile. Very similar to that of *P. gamma*. (Adapted from notes by Mr. W. Warren.)

August to May, or the beginning of June, upon *Eupatorium cannabinum* (Hemp-agrimony), *Salvia glutinosa* (abroad), and mint. Mr. Warren says that its habit appears to be to eat the young leaves at the top of the plant of *Eupatorium* and work downwards.

PUPA black, except the wing-cases and front surface, which are pale green. This, three or four days before emergence, changes into dull pink. In a thin oval cocoon of silk sufficiently transparent to allow every movement of the larva or pupa to be seen; placed perpendicularly. (W. Warren.)

The moth flies sometimes in the sunshine about its favourite flowers, and must be a gorgeous object when at rest upon a bunch of blossoms of hemp-agrimony. It is said also to frequent blossoms of viper's bugloss and even meadow-sweet at that time, and certainly flies occasionally about bracken and other herbage. But its favourite time of flight is after dusk, at which time it is again attracted by these flowers and those of honeysuckle.

Apparently known as an inhabitant of this country from very early times, but usually only as a rarity. Stephens (about 1830) recorded its capture in some numbers near Newbury, Berks; and about the year 1856 a good number of specimens were taken in successive years on the coast near Deal, Kent. After this it again became very rare, and so continued until 1882, when a few specimens were taken at Chippenham Fen, Cambridgeshire. Here also larvæ were found, and in this and the imago state it has continued to be taken in that neighbourhood, and in some years in moderate numbers. Besides these localities, it is recorded, rarely or singly, from various parts of Kent, Sussex, Hants, Dorset, Devon, Cornwall, the Cotswolds and elsewhere in Gloucestershire, Norfolk, Suffolk, and even Lancashire. Also in Wales, in Glamorganshire and Pembrokeshire. I know of no other locality in these islands. Abroad, though rather local, it has a very extensive range—the South and East of France, Northern Germany, Switzerland, Northern Italy, Northern and Eastern Turkey, Southern and Eastern Russia, Armenia, Tartary, the mountainous regions of Central Asia, and Japan.

2. **P. chrysitis**, *L.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings broad, pointed, dull brown or reddish-umbreous, with two brilliant golden, or greenish-golden, broad transverse bands, sometimes united below the middle; hind wings dark-brown.

Antennæ of the male moderately thick, almost naked,

golden-brown; palpi short, moderately tufted, curved upwards, tawny; eyes black crusted with brown; head densely tufted with erect orange-red scales; collar orange-brown shaded and edged with darker brown; remainder of the front portion of the thorax, to the top of the very tall squared back crest, dull orange-brown; hinder portion and the edge of the crest dull brown frosted with ashy-grey dots; abdomen pale purplish-brown, the basal segments covered with fluffy whitish hair-scales, and having on the dorsal ridge three large erect chocolate-brown crests frosted with white; beyond these are one or two more prostrate tufts; lateral tufts small, the anal narrow. Fore wings broad, rather pointed; costa very faintly curved from the base, more so near the tip; apex sharply angulated; hind margin hollowed in the faintest degree below it, then full and nearly perpendicular, but rounded off toward the anal angle; dorsal margin rather straight but rounded in toward the base; colour dull brown with a tinge of reddish, but the surface mainly occupied by two broad, burnished, golden or golden-green bands, one in the basal half of the wing, broad in the middle, narrow toward both wing-margins; the other placed beyond the middle and so broad as to occupy the whole hinder area except a narrow hind-marginal stripe. In many individuals these two golden bands are united by a similar streak or bar, which is often narrow but sometimes quite broad, crossing the central stripe of ground-colour; lines all extremely obscure, the basal as a slender curved chocolate thread, while the first and second appear in each case as a short velvety chocolate and gold streak, springing from the dorsal margin, and continued as an equally faint slender thread; subterminal line merely a shade of shot colour in the golden band, spreading near the anal angle into a squared similar spot; upper stigmata both indicated by slender chocolate marginal lines, but supplemented, beneath the median nervure, by a similar loop-like spot only visible under a lens; cilia frosted purple-brown. Hind wings broad,

rounded behind, uniform dull brown with a purplish flush; cilia paler. Female extremely similar.

Underside of fore wings dull smoky-brown; costal margin narrowly, and hind margin broadly, pale purple-brown; dorsal margin whitish. Hind wings dull pale ochreous dusted with brown and having a slender central brown transverse line. Body and legs yellow-brown; front tibiae white with thick golden-brown tufts of scales on the knees.

Variable in the colour of the golden bands, as already described, irrespective of sex, from brilliant gold or even brassy gold colour to a rather dull green-gold; but there is reason to believe that the shade of colour changes during life, from damp or other causes, from the brilliant to the green gold. Except in the separation or junction of the two bands there is little other variation.

On the wing in July and August, and rarely, as a second generation, in September. But in the year 1896 this second brood was found in plenty in the New Forest, Hants.

LARVA plump, tapering off smaller toward the head; the anal segment also tapering off suddenly and rather elongated; head rounded, yellow-green; body pale green; dorsal line deeper green, bordered on each side by undulating white lines, which from the fifth to the twelfth are swollen and attenuated on every segment, and usually interrupted at the incisions; on the same segments the lateral surface is occupied by oblique shorter white lines which unite with those on the back, and are margined beneath by a more slender and continuous white line, below which is the spiracular line, also white, broad, and continuous from the second to the tip of the anal segment; on the second to fourth and the anal segment the white lines are fewer and placed longitudinally; legs and prolegs green, the anal pair rather extended; undersurface green with minute white dots.

August to May, and sometimes a second generation in

July and August (which in warmer climates is constant), on stinging-nettle and dead-nettle (*Lamium*). Reported also to feed upon *Salvia*, *Echium*, and *Marrubium* abroad, and Mr. Stainton gives thistle as a food-plant. It hibernates when quite small, among dead leaves upon the ground.

PUPA black-brown, and provided with a long tongue-case. In a soft silken cocoon. (Hofmann.)

The moth hides usually during the day among herbage, but has been observed to fly in hot sunshine and even to bask on sunny walls. Its ordinary flight is at early dusk, and again at about 10 p.m., and it is strongly attracted by the blossoms of *Ballota nigra* and other *Labiates*, as well as by those of campion, thistle, garden-flowers, and probably any honey-producing blossoms available. It also flies about beds of nettles, and is a constant frequenter of weedy lanes, hedge-sides, and rank ditches, as well as cultivated ground. Apparently found all over England and in many districts in abundance; doubtless also in suitable places throughout Wales, since I have taken it in Pembrokeshire. In Scotland it is plentiful on some parts of the East coast, particularly in Kincardineshire; found also in the South in Wigtownshire, in the West in Ayrshire, Renfrew, Arran and elsewhere in Argyleshire; locally abundant in Perthshire, and extending to Moray and Sutherlandshire, but apparently not to the Isles. In Ireland generally distributed and often abundant. Abroad its range extends through Northern and Central Europe, Italy, Sardinia, Russia, Southern and Eastern Turkey, Armenia, Tartary, Japan, and the mountainous regions of Central Asia.

(*P. aurifera*, *Hüb.*—A very handsome species, fore wings purplish-brown, with a large brilliant golden stripe or blotch, commencing as a point at the middle of the first line, widening gradually, then suddenly, until it occupies the whole hind marginal space. It is figured as British by Humphrey and Westwood, Mr. J. F. Stephens having recorded the capture

of a specimen near Dover, and another near London. A reputed British example was in the collection of the late Rev. H. Burney, and another is, I believe, still in that of the late Mr. Robertson of Limehouse, now in the possession of his son, Mr. George Robertson, at Liverpool. If either of these specimens was really captured in this country the species has doubtless long since died out. It seems to have disappeared from the South of Europe, and is now known as an inhabitant of India, China, Java, South and West Africa, Madagascar, Mauritius, Ascension, the Azores, the Canaries, St. Helena, and Madeira.)

3. **P. moneta**, *Fab.*—Expanse $1\frac{3}{8}$ to $1\frac{5}{8}$ inch. Fore wings broad, blunt, light brown, almost wholly suffused with golden clouding; orbicular stigma duplicated as two perpendicularly placed golden rings or *coins*. Hind wings pale brown with darker nervures.

Antennæ of the male rather thick, minutely notched, ciliated with scattered fine bristles, yellow-brown; palpi long, curved upwards, the apical joint curling back above the head, golden-brown, with a dark brown stripe up the outer side; eyes brown-black; head not strongly tufted, half concealed by the long curved palpi, whitish-ochreous dusted with brown; collar similar, dotted with black in front, but edged with light brown; thorax also whitish-ochreous dotted with brown and black, but wholly raised into ridged tufts, the shoulder-lappets, the front portion, and the large divided back crest being all erect or nearly so; fascicles pale yellow; abdomen very pale purplish-brown dusted with golden-yellow; basal segments covered with long dusky white hair-scales; on the first and third segments are conspicuous purple-brown dorsal crests; lateral tufts small; anal tuft narrow, light brown. Fore wings pointed, but very broad behind; costa straight or almost hollowed to near the tip, where it is a little rounded; apex angulated; hind margin below it faintly hollowed, then

filled out strongly in the middle and rounded off to the dorsal margin, which is faintly curved; colour pale purplish-brown or yellowish-chocolate shaded or dusted almost all over with dull golden; basal line partial but double, slender, chocolate-brown; first line similar, placed not far from the base, enclosing in its curves golden spots; second line of the same colour and also double, beautifully rippled in crescents; beyond it the costal and apical region is occupied by a large golden blotch edged below with rich chocolate, from which starts an obscure partial subterminal brown line or shade; orbicular stigma round, broadly margined with brilliant pale gold, which is divided and surrounded by chocolate lines; attached immediately beneath it is a larger, similarly gold-edged supplementary stigma below the median nervure, the two looking like a pair of tiny gold coins (hence its name); reniform stigma only suggested by some golden dots ringed with chocolate in the position of its upper margin; crossing the wing and surrounding the two coin-marks is a rich chocolate cloud shaded off on each side; extreme hind margin edged with a chocolate line; cilia shining pale purplish-brown. Hind wings rather broad, the hind margin sinuous, smoky-brown, rather paler towards the base; nervures a little darker; cilia white clouded with pale brown. Female very similar, but with the abdomen stouter.

Underside of the fore wings pale smoky-brown, clouded along the costal and hind margins with whitish-yellow; beyond the middle is a faint, slender, smoky-black transverse stripe, most noticeable at the costa. Hind wings pale straw-colour dusted with brown; a slender smoky-brown transverse stripe before the middle and another beyond, outside which is a broad cloudy smoke-coloured band and a slender brown line along the hind margin; cilia white faintly clouded with brown. Body and legs pale yellowish-brown; front tibiae browner.

Not variable, except a little in the degree of dull gold suffusion over the fore wings.

On the wing from the end of May to July and as a scarcer second generation at the end of August and beginning of September.

LARVA stout, anterior segments regularly smaller, but not conspicuously so; whole body sprinkled with fine short bristles; head small, yellow-green; general colour bright green or grass-green; dorsal line darker green enclosed between several parallel slender white longitudinal lines; subdorsal line faintly yellowish; spiracular stripe cloudy-white; on the sides are three rows of small white dots; spiracles also white; legs and prolegs green. When very young grey-black with white dots and slender white spiracular lines, as it grows older dark bluish-green abundantly dotted either with black or white. When half-grown more olive-green, with black head and legs, an obscure pale spiracular line, and the raised dots still as before; at the last moult the black dots disappear.

May and June and as a partial second brood in July and August; on *Aconitum napellus* (Monkshood), *A. lycoctonum*, various species of *Delphinium* (Larkspur), and *Trollius europæus* (Globe-flower); feeding on the blossoms as well as the leaves. Upon this point Mr. H. F. de Laune has kindly furnished some information: "I found several in April feeding in the young flower-buds of monkshood. They carefully spin all round the flowers and feed upon them until either the last moult or the last but one, when they go to feed on the leaves. These are nibbled in the middle until they droop, the larvæ feeding all the while on the undersides. The young larvæ in the flowers are easy to find; but when feeding upon the leaves they are much more difficult, owing to their being of exactly the colour of the food-plant. They are very easy to rear in captivity." In France it is reported to have been found feeding also on sunflower, Jerusalem artichoke, burdock, cucumber, and a variety of other plants.

39 Linden Grove
Portsmouth
London S.E.
23 Feb 1898

My dear Sir

The history of *Thomomys*
chonetæ in this country is
very curious. Until the year
1890 no one I suppose con-
sidered it as an inhabitant
of these Islands, but in that
year one was taken at Cove,
near Cambridge Wells near
Reading. There was also one taken

a small migration from the
(interior of the golden blue.

from this case it has increased
in numbers from year to year
All now of which can only be
called a rare species and there
are gardens in the country
and in the country in a tree & if you
be confident it is a new species
you. Very like some well known
bees, indeed the moth would not be
very rare with some it was taken here
without apparent looking for it!
Should not notice sugar and would

fly to flowers - Acornite, on top,
Pylon to line - sweet william in
last acornite, Monkshood especially.
such, Puccinia feeds on Monkshood
in, I think (Mon. a. Acornite) in again
in August the moth has been here
thyl and top. The pupa is
blurred on the under side of a
leaf of Monkshood and is almost
as dense as a cottony off that is
known. I have not found
it in the garden yet summer.
I am not sure whether the winter
is passed in an egg or larva state.
I have only, but find even like
my Cook. I am not sure.

as well can. Thank you very much
for your offer of help. The greatest
help that can be given is to furnish
such items as the life-hiding crickets
are now under your
observation. No, not the now, with
a lens, to find out whether there
are eggs or insects in some houseworts
or young larvae hiding themselves in the
thick dead leaves. Would that not
be worth while?

Yours very truly
Chas. J. Smith

Gipsy Garden Grove
1 Van Ness
San Francisco
23 Dec 1878

My dear Sir
I thank you very much
heartily for keeping me in
mind and sending me such
this useful information about
Cousin Maria. I would
like to make some additions
to the last volume of my

in A + B. I would not see of
to K. I see. I think that
we have dealt with the
necessary point, and indeed
that I congratulate you on
your excellent observation,
in addition to all, you
are so very kind as to offer me
two specimens of the moth.
I have now, it might be said
in being the possessor of two as
British types - since now that
my time is taken up with the

work on the subject I am not
able to collect much, and so
do not get in much as I do
me. Your offer is therefore
most acceptable. I shall be
exceedingly glad of them.

I do not know whether
there is anything in the
Zygane genus from which
any of use to you but I
have a pair of the species
which are at present in the
Zygane genus.

PUPA plump and rounded, having in front a long conspicuous tongue case, the free end of which extends down the front of the abdominal segments; back of the thorax dull with abundant sculpture of minute pits; a narrow band of similar pitting on the front edge of each segment; remaining surface smooth and shining; cremaster short, but of even breadth to the tip, there furnished with minute hooks; the wing, tongue, and limb-covers, with all the rest of the front surface, green, and the skin thin and semi-transparent; dorsal surface or dorsal stripe abruptly pitchy-black or reddish-brown with the skin opaque; cremaster of the same colour. The extent of black colouring, however, appears to be irregular, or it is even occasionally absent. In a beautiful elongated cocoon of soft strong silk, usually of some shade of yellow or even ochreous colour, but varying to white; spun up among the leaves of the plant upon which it has fed. This cocoon is singularly like those of some of the Bombyces, even that of the silkworm (*B. mori*).

I cannot find that this moth has been observed in the daytime here, either on the wing or at rest, but it doubtless hides among its food plants and other herbage. At dusk it flies, and has been taken hovering at blossoms of monkshood, larkspur, red valerian, carnation, sweet-william, foxglove, and other plants, and later in the night at light, but hitherto seems to be almost confined to gardens or their immediate neighbourhood. So far as I can ascertain it was not noticed in these Islands before the year 1890, and, indeed, was looked upon as a species unlikely to occur in this country, being, until recently, of rather Southern distribution; and its appearance and progress here furnish one of the most complete records of the immigration and establishment of a species yet observed. The first specimen noticed in these Islands was captured at Dover, at flowers in a garden; it was brought to Mr. Sydney Webb to be named, and is now in his collection. On July 2nd of the same year a specimen was taken at light, near Reading, Berks, by Mr. W. Holland,

and another at a similar attraction, by Mr. W. M. Christy, at Emsworth on the borders of Sussex and Hants. In the same year it seems to have been found at Tunbridge Wells and at Cambridge, and in the following at Guildford, occurring also again at Dover. From this time it has increased in numbers and in range, and is taken, either as moth or larva, every year in some favourite spots in Surrey, Kent, Cambridgeshire, Berks, and elsewhere. It has been found also in the immediate vicinity of London—at Lee by Mr. B. A. Bower, and at Woodford by Mr. Oldham—and has spread into various parts of Essex, Middlesex, Hants, Herts, Leicestershire, and even Norfolk, several specimens having been taken on the wing near Norwich by the Messrs. Tillett and others. Doubtless it has reached many intermediate counties, and there is good reason to hope that its range here will soon be still further extended. In this connection it is interesting to notice what has occurred abroad. Herr August Hoffmann says, in the *Entomologists' Monthly Magazine*, that it was known to be a common species in the South and South-east of Germany, but until the year 1875 was not recorded from the North-west of that country nor from the Netherlands. In that year commenced its migration into those districts, and in a few years it had been found in Hanover, Mecklenburg, Stralsund, Waldeck, and Hamburg; in 1882 it had reached Arnhem in Belgium, and in 1887 Breda in Holland. At the time of its appearance here it had been taken in numbers in the last-named country. He noticed that even the rough climate of the Hartz Mountains was insufficient to check it, for he found larvæ on the *Aconitum* plants in a garden in the district of the Brocken, more than 2000 feet above sea level. In 1890 M. Fallou, a veteran French entomologist, announced that he had captured this species in June of that year, for the first time in twenty years' residence, in the neighbourhood of Paris. It had been noticed in previous years in the Centre and East of France. But according to Duponchel it occurred early in the present century in

Normandy. Elsewhere its ordinary range seems to have been through the South of France, Spain, Germany, Switzerland, Northern Italy, Hungary, Poland, Finland, Russia, Siberia, and the mountain districts of Central Asia.

4. **P. illustris**, *Fab.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings moderately broad, pointed, alternately banded with dull olive-green and purplish-pink in rather narrow stripes; orbicular stigma elongated and edged with white. Hind wings pale smoky-brown.

Antennæ of the male thick, simple, almost naked, whitish-brown; palpi curved upwards and of moderate length, not attaining the top of the head, moderately tufted, pale fulvous; eyes reddish-black; lashes long, dusky, and curled over; head tufted, yellow drab; collar pale yellow, shaded above with pale brown and edged with white; remainder of thorax pale olive-brown with a rather large back crest; abdomen yellow-brown, covered toward the base with long whitish hair-scales; on the dorsal ridge are two dense erect yellow-brown crests tipped with chestnut; lateral and anal tufts thick and spreading, pale yellow-brown. Fore wings pointed, not broad; costa very nearly straight; apex angulated; hind margin regularly and gently curved; dorsal margin hollowed and then a little rounded; colour purplish-pink obliquely striped with olive-green or olive-brown shadings; basal line hardly suggested; first line very oblique, leaning outwards from near the base of the dorsal margin and duplicated, pinkish-white, edged outside to the middle with black; second line conspicuous, very oblique and gracefully curved, double, purplish-pink, divided and edged inwardly with deep olive-brown, outwardly shaded off with pink; subterminal line conspicuous, silvery-white, edged inside on the dorsal margin by a triangular golden-fulvous cloud, outside by smaller clouds of the same colour at the middle and apex; principal nervures white from the base to the middle; over the median are two slender perpendicular white streaks

indicating the orbicular stigma, and beneath it a sort of duplicate stigma is enclosed by a similar white and pink margin; reniform very faintly indicated by a partial white edging, olive-brown divided by a pink shade; hind marginal line silvery-white; cilia similar, shaded and faintly intersected with pale pinkish-brown. Hind wings rounded, the hind margin only faintly sinuous; pale smoky-brown faintly banded in the middle with darker brown; cilia white intersected with brown. Female very similar.

Underside of the fore wings smoky olive-yellow; dorsal margin broadly pearly-white; beyond the middle are two oblique smoky transverse stripes. Hind wings paler smoky-yellow, with a curved and sinuous transverse smoky-brown central stripe, followed by a similar stripe nearer the hind margin; cilia golden-brown. Body and legs pale yellow-brown.

On the wing in June and July.

LARVA bluish-green, with four long black raised dots on the back of each segment, having between them a deeper black-green dorsal line, and two slender longitudinal white lines; spiracular stripe yellow; spiracles and raised dots black; undersurface grey-green dotted with black; head and legs black, the latter with angular green markings. (Hofmann.)

May and June on *Aconitum lycoctonum* and probably allied plants. Curtis says *Thalictrum aquilegifolium*, but this seems to require confirmation.

PUPA dark green with brown shadings. In a delicate white cocoon spun among leaves. (Hofmann.)

This is one of our rarest insects, and its habits here are almost unknown. On the Continent it is said to prefer mountain districts. There is a tradition that it was formerly found commonly upon Salisbury Plain, Wilts, but this is mentioned even by Curtis as merely a report, and if true must have been so at some very early date. In the collection of Mr. J. C. Dale, now in the possession of his son, are two specimens

which were given to him by Dr. Leach, with the information that they were taken on Salisbury Plain, by a Mr. Spratt, in 1810. In the cabinet of the late Rev. Henry Burney, was a specimen evidently of great age, in fair condition but ill set. In that of Mr. Joseph Sparshall, now in the Norfolk and Norwich Museum, is another. A third is in the collection formerly made by Mr. Robertson, of Limehouse, now carefully preserved by his son at Liverpool; and three more are in Dr. Mason's cabinets at Burton-on-Trent, one of them from the collection of the Rev. T. Marshall, of Leicester, the others from that of Mr. Edwin Shepherd. In all probability the origin of all these was the same. Haworth included the species in his "*Lepidoptera Britannica*" on the faith of a specimen which Mr. Donovan informed him that he had himself taken in South Wales. This also must have been very early in the century, and the species has been noticed by subsequent authors as from both localities, yet I know of no more recent occurrence of the species in Great Britain. But in Ireland a single specimen was captured in August, 1887, at Castle Kevin, Wicklow, at flowers of bramble, by Miss Alice Hull. It was handed in a box of other unnamed insects to Mr. G. H. Carpenter, of the Science and Art Museum, Dublin, and its identity was only ascertained by him on a visit to South Kensington. This specimen I have seen in Dublin, and find no cause for doubt as to its authenticity.

Abroad this species is found in Southern and Eastern France, Switzerland, Southern Germany, Northern Italy, Hungary, and the Ural Mountain district, but so far as I can ascertain not out of Europe.

5. **P. bractea**, *Fab.*—Expanse $1\frac{5}{8}$ to $1\frac{3}{4}$ inch. Fore wings of moderate breadth, rather pointed, rich velvety chocolate, with a central, rather pear-shaped, golden spot. Hind wings pale brown with darker nervures and hind margin.

Antennæ of the male long, simple, almost naked, purple-brown; palpi short and rather small, purple-brown, but edged

in front with brilliant orange and crimson scales; eyes black, crusted; head thickly tufted, rich chocolate-red; lower portion of the collar light orange-crimson, upper part pale chocolate edged with white; remainder of thorax tufted with upraised chocolate scales, a very large back crest is tinged with orange-red and tipped with dark chocolate; fascicles large, pale yellow; abdomen of the same colour with a tinge of fulvous, the basal segments covered with long downy hair scales; on the basal and third segments each is a large chocolate-coloured dorsal crest, and a small one on the second; lateral and anal tufts small, tinged with orange-red. Fore wings pointed and rather broad behind; costal margin straight or almost hollowed, but a little arched toward the apex, which is angulated; hind margin immediately beneath it slightly retuse, then fully rounded, also faintly crenulated; anal angle well marked and slightly produced; dorsal margin concave and gracefully curved; colour purple-brown clouded with dark velvety chocolate; first line oblique, duplicated but obscure, attaining the median nervure, chocolate colour, and forming the inner margin of a very large dark chocolate cloud which occupies the dorsal half of the middle of the wing; second line similar, double, more complete but equally obscure and less oblique, beyond it and running in from the apex is a very oblique dark chocolate cloud faintly traceable to the anal angle, its outer edge waved, rippled, and suggesting a faint subterminal line; upper stigmata scarcely indicated by most obscure chocolate streaks, but below the position of the orbicular is an oblique, somewhat pear-shaped, brilliant golden spot placed very conspicuously in the middle of the wing and surrounded by the deep chocolate area; cilia pale purple-brown. Hind wings rounded, smoky yellow-brown, with browner nervures, and a broad ill-defined smoky brown band before the hind margin; cilia smoky yellow. Female extremely similar.

Underside of the fore wings pale fulvous or orange-brown; a large central smoky black cloud over the middle, and a faint

similar transverse line beyond. Hind wings dull yellow, dusted with orange-red, especially so along the costal region; nervures yellow-brown. Body pale tawny-brown with a red flush; front portion of the legs purple-brown with orange-crimson tufts.

Hardly ever variable, but in the collection of Mr. S. J. Capper, at Huyton Park, Liverpool, are two in which the shape of the gold spot is altered into an irregular rhomboid.

On the wing at the end of June, in July, and even August. A second generation has been met with in September in Ireland, and has also been reared in October from larvæ kept in a warm greenhouse.

LARVA when full grown provided with only six prolegs; it has a habit of greatly lengthening the anterior segments when feeding or walking, so as to make them appear very slender in comparison to the rest of the body. Colour bright rich green; dorsal line narrow, darker green; on the sides are three wavy white longitudinal lines, but so slender as hardly to be noticeable; all the portion below the spiracles darker green than the upper surface; head green with black mandibles and a black stripe on each side; on the anal segment are two dark points. (Mrs. Battersby.) Mr. Buckler's figures show also a yellowish-white spiracular stripe and the spiracles and raised dots white. When young it is wholly dull green.

August to May or the beginning of June, hibernating when about half an inch in length. On stinging nettle, blind nettle (*Lamium album*), groundsel, hawkweed, dandelion, honeysuckle, and in the spring it feeds readily on cow-parsley (*Cherophyllum*). In confinement it has also been known to feed upon lettuce and plantain. If kept in a warm greenhouse, and quite protected from cold, the young larvæ may sometimes be induced to feed up rapidly in the autumn and to produce the imagines before winter.

PUPA apparently undescribed, in a semi-transparent cocoon of white silk.

The moth sits during the day among herbage, but has occasionally been seen to fly in the sunshine. At dusk it is very lively and active, and eagerly seeks the blossoms of honeysuckle, ragged-robin (*Lychnis flos-cuculi*), *Silene inflata*, *Epilobium angustifolium*, even wild thyme, thistle, and knapweed; and in gardens the Martagon lily, sweet-william, white rocket and *Viola cornuta*. In very rare instances it has been found attracted by light. Its home is mainly in the northern half of England—Herefordshire, Worcestershire, Shropshire, Cheshire—formerly rather common near Macclesfield—Yorkshire, Lancashire, Westmoreland, Cumberland, Durham, and Northumberland—especially near Morpeth. Doubtless it is to be found in Wales, but except of the capture of a single specimen in Carmarthenshire, evidence is lacking. In Scotland it is widely distributed, Berwick, Hawick, Wigtonshire, Roxburghshire, Lanark, Stirlingshire, Perthshire, Ayrshire, Kincardineshire, Aberdeenshire, Moray, Oban, Balmuto, and elsewhere in the districts of the Solway, Clyde, Forth, Tay, Dee, Moray, Argyre, and West Ross. In Ireland also found in numerous localities in Wicklow, Waterford, Cork, Kerry, Dublin County, Meath, Kilkenny, Westmeath, Clare, Galway, Sligo, Fermanagh, and Donegal, and in some of them in plenty. Abroad it is somewhat more addicted to mountain districts, and is found in Germany, Switzerland, Livonia, Finland, Central Russia, the Ural Mountains, Tartary, the mountainous regions of Central Asia, and Japan.

6. *P. festucae*, L.—Expanse, $1\frac{3}{8}$ to $1\frac{5}{8}$ inch. Fore wings rich chocolate-red, shaded with brilliant gold and ornamented with three conspicuous spots of burnished gold, two in the middle and one toward the apex. Hind wings smoky brown with purple cilia.

Antennæ of the male simple, finely ciliated, coppery-brown; palpi curved up and attaining the top of the head, rich

chestnut-red; eyes black, back lashes abundant, dark red; head densely covered with scales, the tufts divided by a deep channel on the top and again by a transverse one just below the antennæ, brilliant orange-chestnut; thorax purplish-chestnut or coppery-red and densely crested at the back, the long erect scales tipped with darker purple-brown; fascicles slender, dusky yellowish-white; abdomen purple-brown with long yellow-white hair-scales on the basal segments, almost concealed by which are short chestnut-coloured dorsal crests on the first two or three segments; lateral tufts spreading, anal tuft small, all purple-brown. Fore wings pointed, not very broad, costa nearly straight, hollowed a little in the middle, faintly arched before the apex, which is sharply angulated; hind margin oblique, very nearly straight but rounded off at the anal angle; dorsal margin very gracefully curved; colour rich dark tawny or orange-chestnut shaded with burnished gold; a golden dash from the base is shaded off along the subcostal region; another from the dorsal margin points obliquely across the wing, and indicates the usual first line, which otherwise is hardly perceptible; at the top of this golden streak is a horizontal rather pear-shaped or ovate spot of brilliant gold, and outside it another rather smaller; between these runs a faint slender dark chestnut line from the dorsal margin representing a central shade, and beyond them another, indicating the second line, but only perceptible near the margins; outside this, in the costal half of the wing, is another brilliant gold marking or spot, narrower but shaded off in fainter gold to the apex; subterminal line a faint obscure series of dark chestnut angles; cilia dark purple. Hind wings rather large, dark smoke colour with a purple flush; nervures dark brown; cilia light purple. Female extremely similar.

Underside of the fore wings smoky-black with the costal and hind-marginal regions purple, and two obscure smoky-black transverse bars through the costal area. Hind wings smoky pale yellow strongly shaded with purple, especially so

toward the apex ; central spot black ; beyond the middle is a sinuous smoky transverse stripe, outside which the nervures are tinged with the same colour. Body and legs purple-brown with black shading.

Usually not variable, but Mr. W. H. B. Fletcher has examples of a rich pale chestnut colour devoid of darker shading ; sometimes also the two gold spots are separated only by a faint line. Some years ago I saw in Liverpool some unusual forms which had been reared in autumn from larvæ found near Warrington. Of these some had the pair of gold spots quite joined together, while others, in which they were separate, had the first spot of double the normal breadth. Some variation in this direction seems also to occur in Ireland.

On the wing in June and July, and as a second generation in August and September. This, however, appears only to have been observed locally, more especially in Cheshire, and in Scotland and Ireland, and probably depends in some degree upon the season.

LARVA pale green with a yellow cross-streak on each segment ; dorsal line deep green edged with white, and having on each side several fine yellowish longitudinal lines ; spiracular stripe white, shaded with dark green ; head brownish-green. (Hofmann.)

April to June, and in a second generation at the end of June and in July or even August, on various species of *Carex* (sedge) and *Festuca* (grass), also on *Sparganium ramosum* (bur-reed), *Iris pseudocorus* (yellow-flag), and even *Alisma plantago* (water-plantain).

PUPA at first greenish-yellow or bone-coloured, with the dorsal region brown, when more mature pitchy-black, the limb-cases rather more pitchy-brown and shining, the wing-covers very dull black, yet hardly roughened and showing little or no sculpture ; abdomen slightly glossy, the edges of the segments rather ridged and sharp ; cremaster thick, rather short,

furnished with a pair of hooked spikes and several attendant bristles. In a very tough cocoon of greyish-white silk placed usually on the underside of a leaf of yellow-flag, bur-reed, reed, or even broad grass which has been bent, and strongly drawn down, so as to render the cocoon inconspicuous. Sometimes lower down, among the grass stems or under a leaf lying upon the ground.

The moth frequents marshes, fens, swampy meadows, and the banks of streams, and usually sits concealed during the day among the herbage, but on warm afternoons will sometimes fly immediately after sunset, looking very bright and pretty when hovering at flowers. Its usual flight is, however, at dusk, and it then comes eagerly to blossoms of yellow-flag, purple loosestrife, mint, ragged-robin (*Lychnis flos-cuculi*), *L. respertina*, *Silene maritima* (near the sea), *S. inflata*, *Stachys palustris*, *S. sylvatica*, turn-cap lily, rhododendron, and bramble. It has even been captured hovering at sugar. Not common in the South of England, though recorded in Devon, Cornwall, Somerset and Dorset, and rarely in Sussex, Wilts, Berks, and Gloucestershire; more frequently in Essex, Suffolk, and Norfolk; less so in Warwickshire, Staffordshire, Derbyshire, Leicestershire, Herefordshire; much more commonly in Cheshire, Lancashire, and Lincolnshire, and usually in two generations, yet in Yorkshire apparently in one only; and rather locally in Westmoreland, Cumberland, Northumberland and Durham. Generally distributed in marshy spots in South Wales, being recorded in Glamorganshire and Carmarthenshire, and found by myself rather freely in Pembrokeshire; apparently local in North Wales. Very generally distributed in Scotland to the districts of Moray and Argyle. In Ireland the Hon. Emily Lawless found it in plenty in Kerry on the very margin of the sea, and also in Connemara. Further recorded in Cork, and widely though sparingly distributed through the middle of the country to Armagh, Antrim and Londonderry. Its range abroad is through Central Europe, the temperate regions of Northern Europe, Spain,

Corsica, Northern Italy, Southern Russia, Tartary, and the mountain regions of Central Asia.

7. **P. pulchrina**, *Haw.*; **v-aureum**, *Gn.*—Expanse $1\frac{1}{2}$ to $1\frac{5}{8}$ inch. Fore wings rather pointed, rich light purple-brown, much waved and mottled with velvety chocolate; in the middle is a golden Y, usually broken, and there is a fine gold edging to the reniform stigma. Hind wings smoky yellowish-white with blackish-brown nervures and hind-marginal band.

Antennæ of the male simple, minutely ciliated, purplish-drab; palpi rather long, upraised, the points extending to above the head, light purple-red; eyes black, front and back lashes reddish-brown; head purple-red, very strongly tufted on the face and between the antennæ, the tufts divided by a deep transverse channel; thorax chocolate-red, the collar edged with pink, the shoulder-lappets barred and edged with the same, and the crests, which are tall and occupy all the middle space, hollowed, divided, and tipped with white; fascicles yellowish-white; abdomen pale purplish-brown, the basal portion covered with long yellow-white hair-scales and ornamented with three chestnut-coloured dorsal crests, of which the first and third are tall and conspicuous; lateral tufts spreading, and, with the anal tuft, dull purplish-brown. Fore wings narrow at the base, broad behind, costa very nearly straight but a little arched toward the apex, which is pointed and slightly produced; hind margin below it straight, almost retuse, prettily crenulated, and rounded off to the anal angle; dorsal margin very gracefully hollowed and curved; colour singularly beautiful, bright purple-red, abundantly rippled and shaded with velvety chocolate; basal line double but partial and obscure, faintly silvery-white in a chocolate cloud; first line very oblique from the dorsal margin and rather direct to the median nervure, thence bent deeply back, then curved forward considerably and again bent back to the costa, silvery-purple, edged on both sides with chocolate; second

line double, oblique, deeply indented above the dorsal margin, cloudy chocolate; subterminal line only distinct above the anal angle as the edge of a chocolate streak, but obscurely indicated here and there in a burnished golden-chocolate cloud which lies along the hind margin to the apex; this below the middle is suffused with a shot-golden tinge; orbicular stigma faintly indicated, but its base rather more distinctly by a slender curved pale golden line; this attains the top of an oblique burnished golden **Y**-mark, which, however, is very commonly broken into a **V** and a round spot below it; reniform stigma obscure and placed in a chocolate cloud, but constricted and defined by an excessively slender golden margin; below this the middle area of the wing between the first and second lines, and enclosing the **Y**-mark, is occupied by a large chocolate-red cloud, and immediately below by a chestnut cloud edged with chocolate, but the ground colour asserts itself toward the dorsal margin; extreme hind margin edged with pale purple and a chocolate line; cilia purplish-white with chocolate clouding. Hind wings large with the apex rather angulated and the hind margin sinuous and crenulated, smoky yellowish-white; nervures smoky-brown; across the middle is a slender similar cloudy stripe; hind margin broadly clouded with the same; cilia brownish-white clouded with brown, but having also a purple flush. Female extremely similar, but with a thicker body.

Underside of all the wings pale golden-brown with two transverse darker stripes beyond the middle, and the forewings clouded with smoke colour, the hind with yellowish-white. Body and legs reddish-brown.

Variation is usually very slight, and confined to the degree of completeness of the **Y** and the extent of chocolate shading. Some specimens, however, taken in Gloucestershire by the Rev. Alexander Nash, are pale pinkish-purple with violet reflections and a very pretty curved stripe of paler colour close to the base. In Sligo, Westmeath, and elsewhere in Ireland it is found in a rich, dark, strongly rippled form, and at Armagh

with a large orange spot in the middle of the fore wings. Very dark forms are found in the North of Scotland.

On the wing in June and July.

LARVA stout with a bristly appearance from numerous stiff short hairs, anterior segments rather tapering; head small, rounded, glossy green; mouth and a stripe on each side black; body pea-green with the dorsal surface almost white, having broad dorsal and subdorsal lines and five intermediate longitudinal more slender lines white, so as to fairly crowd all this portion of the body; spiracular stripe yellowish-white; spiracles yellowish-white, edged with brown; undersurface darker green. Sometimes the central dorsal line is deeper green and the white stripes become rather more lateral, or are reduced in number, to the increase of the green area.

Mr. Porritt says that the newly hatched larva is greyish-white, indistinctly spotted with black, and with the segmental divisions smoke-colour.

August to May, hibernating when little more than half an inch in length. On honeysuckle, white dead-nettle, common avens, cow-parsley, groundsel, and other herbaceous plants; feeding mainly at night and hiding frequently under the leaves of the food-plants by day.

PUPA of the usual form, provided with a thick tongue-case, projecting beyond the wing-covers, in front of the abdominal segments; wing-covers, back of the thorax, and the tongue-case, dull pitchy-black, remaining surface rather more glossy brown-black, almost devoid of sculpture; cremaster black, short, thick, and rather bulbous, with very short hooked bristles. In a thin but tough dirty-white cocoon, under a leaf or among rubbish on the ground.

The moth hides in the daytime among herbage, often in the more bushy annuals in gardens or the plants on hedge banks. At dusk it flies actively to flowers of honeysuckle, turn-cap lily, thistle, nettle, *Lychnis*, and probably to any

honey-producing blossoms. It is particularly fond of gardens and lanes, but is also to be met with in the more open rides of woods, and is found sparingly all over the South of England, though rarely in Cornwall; also throughout the rest of England, becoming more common in the Midland and Western counties and less so in the Eastern. Probably to be found throughout Wales, and certainly at Pembroke in the extreme west. In Scotland at Hawick and commonly in Wigtownshire, also in Ayrshire and elsewhere in Clydesdale, Cantire and other parts of Argyle, Perthshire, Aberdeenshire, and Kincardineshire; indeed, Dr. Buchanan White recorded it throughout the country to Moray, West Ross, and the Orkneys. Generally common in Ireland. Abroad it probably has a wide range, but its localities seem to be mixed with those of *P. iota*. It extends through Central Europe, the temperate parts of Northern Europe, Northern Italy, and some portions of Russia, if not farther.

8. **P. *iota***, *L.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Fore wings rather pointed, rich light purple-brown, with a large rhomboid dorsal chocolate blotch which extends across the wing sufficiently to enclose the golden **Y**, either complete or broken. Hind wings pale golden-brown; nervures darker.

Antennæ of the male long, simple, minutely ciliated, light purple-brown; palpi short, slender, pointed, rather oblique but hardly upraised, orange-red; head tawny, strongly tufted, and between the antennæ conspicuously ridged; eyes leaden-black; collar large, orange-red shaded slightly with brown, and edged with white; remainder of thorax orange-brown, back crest very large, divided, and produced into high ridges tipped with tawny; shoulder-lappets also rather raised and tipped with the same, or else frosted with purple; fascicles pale yellow; abdomen dull pale purple-brown, the basal half abundantly covered with long dull yellow hair-scales, but having a large broad chocolate crest upon the basal segment, followed by a shorter broad tuft, and this by a very conspicuous

similar crest, behind which is a thick dusky yellow tuft; lateral tufts large, purple-red; anal tuft small, red-brown. Fore wings pointed, moderately broad behind; costa almost straight or faintly concave to near the tip, where it is a little arched; apex angulated; hind margin rather oblique, very gently curved, and full at the anal angle; dorsal margin gracefully curved; colour light purple-red clouded with chocolate; basal line faintly visible but broken, pale chocolate, followed by a parallel, obscure, similar transverse cloud; first line very oblique, straight, double and distinct from the dorsal margin to the median nervure, thence obsolete; second line equally oblique and almost straight, terminating unusually near to the apex of the wing, double, faintly rippled, chocolate; bounded by these last two lines, and above by the median nervure, is a large conspicuous rhomboid blotch of velvety chocolate, and in its upper area is placed a brilliantly golden Y-mark either complete or divided; subterminal line irregularly angulated, edged on the inside with a broad clouded chocolate band, and having, half-way up the outside, a similar cloud shot with a golden gloss, as is also the contiguous portion of the inner band; along the costa is a succession of faint cloudy chocolate spots, one of which extends itself and forms the extremely faint edging of a hardly perceptible reniform stigma; extreme hind margin edged with a slender brown line; cilia pale purple dashed with light brown. Hind wings broad, faintly hollowed below the apex but fairly rounded; pale smoky-brown shading into a darker smoky cloud along the hind margin, the whole with a slight yellowish gloss; there is also a smoky-yellowish transverse central stripe, in which more particularly the nervures appear darker brown; cilia dusky pale yellow, or yellowish-white, dashed with brown. Female extremely similar.

Underside of the fore wings pale golden-fulvous clouded with smoke colour, especially so on the nervures, the reniform stigma, and two slender transverse stripes. Hind

wings orange-yellow, dusted with smoky-brown, and having a slender, sinuous, central, transverse smoky-brown stripe. Body and legs orange-red or tawny-red.

Very little variable except in the completeness or division of the central gold Y; but in the collection of Dr. P. B. Mason is a specimen of a very beautiful pale grey tinged with purple, except the usual rhomboid chocolate dorsal blotch.

On the wing in June and July.

LARVA velvety, attenuated in front, segmental incisions rather deep; body with a pulsating dorsal vessel and numerous short inconspicuous pale bristles; head small, rounded, shining, pale green with the mouth brown; body bright light yellowish-green; dorsal line slightly darker, dilated in the middle of each segment, and edged with curved whitish lines; subdorsal stripe composed of numerous whitish curved lines; spiracular line threadlike, yellowish; between the dorsal and subdorsal lines are traces of pale curved dashes; usual raised dots white; undersurface slightly darker than the ground colour; prolegs tipped with dark brown. (C. Fenn.) Mr. Buckler says that the young larva immediately after hatching is dirty-white, or of a brownish-white gelatinous appearance, the raised dots dark brown; the month and side markings of the head dark grey-brown. Hybernation takes place while still small, not more than half an inch in length, and it is then bright yellowish-green, the dorsal stripe darker, edged with whitish-yellow lines, outside which are similar lines, followed by the subdorsal and spiracular of the same colour, the latter rather the broader; raised spots shining white, each with a dark brown hair.

August till May on *Lamium album* and *L. purpureum* (white and purple dead-nettles), *Stachys sylvatica*, *Heracleum sphondylium*, *Anthriscus sylvestris*, nettle, honeysuckle, and even hawthorn. Hofmann says especially upon species of *Mentha* and *Stachys*.

PUPA rather elongate: tongue-case forming a large ventral projection; tail hooked and attached to the cocoon; colour deep pitchy-brown, almost black, the incisions of the segments tinged with green. In a thin oval cocoon of pale brown silk among leaves or rubbish on the surface of the ground. Mr. Buckler says that in its earlier stage the pupa is green with crimson spots down the back, and that it gradually changes to pitchy-black.

The moth hides in the daytime among herbage on hedge banks and waste places and in the more bushy plants in gardens, and seems to be more especially attached to such situations. At dusk it flies eagerly to the blossoms of various labiate plants and of honeysuckle, *Lychuis flos-cuculi*, and *L. respertina*, and occasionally comes to light. It seems to be found throughout England, rarely in the south-eastern corner, yet commonly in Essex, and moderately so in most districts. Probably also throughout Wales, since it is common in Carmarthenshire and has been taken in Pembrokeshire. In Scotland it is less common, but is found in Berwickshire, Wigtownshire, Ayrshire, Perthshire, Dumbartonshire, where it attains rather a large size, Argyle, where it is scarce, and elsewhere to Moray, West Ross, and the Orkneys. Rather local in Ireland, but has been found near Dublin, in Wicklow, Meath, Westmeath, Galway, Sligo, Monaghan, Armagh, Antrim, and Derry. Abroad its localities, as already remarked, seem to be rather mixed up with those of the preceding species, but there seems to be no doubt that it is well distributed over Central Europe, the temperate portions of Northern Europe, North Italy, Russia, Armenia, Siberia, and Persia.

(**P. verticillata**, *Gn.*; **acuta**, *Walker*.—A specimen was recorded in the year 1870 as having been captured in a drawing-room at Tunbridge Wells, Kent, attracted by a light. This specimen I have not seen, nor do I know where it now is, but Dr. H. G. Knaggs reported in the *Entomolo-*

gists' Annual for 1871 that it agreed to the minutest detail with the type of *P. acuta* in the British Museum. The types of *P. verticillata*, Gn., and of *P. acuta*, Walk., in the British Museum, are now placed as forms of *P. eriosoma*, Dbld., a species closely allied to *P. iota* and *P. pulchrina*, especially to the latter, but having the upper portion of the Y-mark filled up into an irregular spot, and the lower portion separated to a greater distance and forming another spot of nearly the same size. There is before this marking an obscure double curved line or stripe placed obliquely almost across the base of the wing. Still, it might readily be passed over as a variety of *P. pulchrina*.

Dr. P. B. Mason has recently identified this with the species named *P. bimaculata* by Stephens, of which but one reputed British example was known. In the National Collection this species—from North America—is placed next to *P. eriosoma*. In these various forms the insect is found, not only in North America, but over large portions of Asia, Africa, Australia, and New Zealand; but the two or three specimens reputed to have been found in this country can be nothing more than accidental introductions.)

9. **P. gamma**, *L.*—Expanse $1\frac{1}{4}$ to $1\frac{3}{4}$ inch. Fore wings rather pointed, silvery-grey, or purplish grey-brown, hinder portion extremely glossy; a complete and very distinct Y-spot in brilliant silver in the middle is surrounded by black clouding. Hind wings smoky yellowish-white with a broad smoky-black hind border.

Antennæ of the male simple, long, minutely and closely ciliated, grey-brown; palpi rather short, moderately tufted, dark slate-brown; eyes large, leaden-brown, lashes erect; head prominently tufted, the tufts divided by a deep cross-channel beneath the antennæ; thorax dull brown, crossed with fine lines of deeper brown and white which doubly bar the collar, triply the shoulder lappets, and edge every tuft of the large compound back crest; fascicles smoky-white; abdo-

men smoky-brown, abundantly covered from the base to the middle with long smoky-white hair-scales, behind with shorter smoky-brown ones; on the back of the basal segment is a large and conspicuous dark-brown crest tipped with white, and on the third segment another, a very short one occupying a similar position on the second segment; lateral and anal tufts small. Fore wings long and pointed at the tip; costa very gently arched at the base and apex, nearly straight between; the apex sharply angulated; hind margin oblique, slightly crenulated, straight to near the anal angle, then rounded off; dorsal margin gracefully curved; colour shining silvery-grey, marbled with dark purplish-grey and black; basal line restricted to two black curves edged outwardly with white; first line very obscure, oblique, rather direct to the median nervure, above this much angulated, yellowish-white, clouded on each side with black; second line obscure, dusky-white edged with light brown, twice deeply indented near the dorsal margin, above this direct and oblique; sub-terminal line abundantly angulated, black, edged outside with purplish-white, and bounding or dividing a large shining slate-black cloudy stripe shot in patches with silvery reflections, which runs into the apex, but is sharply cut off below by the ground colour; orbicular stigma oblique and narrow, but very indistinct; attached to it from below the median nervure is a conspicuous burnished silver **Y** (whence the moth receives its names), which is sometimes contracted, but rarely, if ever, broken; it is set off by a deep black edging which shades off outwardly, but all the adjacent portion of the wing is clouded with black, purple-grey, or purple-brown; reniform stigma placed far back, deeply constricted, mainly indicated by a faint silvery margin; cilia pale grey barred and spotted with black-brown. Hind wings broad, with sinuous and faintly crenulated hind margin, smoky-white to the middle, often with a yellowish gloss, nervures smoky-brown; hinder half of the wing occupied by a very broad ill-defined black or smoky-black band; cilia white, spotted with black-brown. Female very similar.

Underside of the fore wings dark smoky-brown, with two yellowish-white clouds in the middle. Hind wings smoky-white dusted with brown, and with a broad smoky-brown band occupying the hind marginal space; central spot very small, black; cilia of all the wings white, strongly spotted with smoky-brown. Body and legs dull smoky-brown, fore tibiæ barred with white.

Variable in size, specimens sometimes occurring of less than one-half the ordinary area of wings, with all intermediate sizes. Mr. Porritt has recorded the rearing from larvæ found in Kent, of the smallest form, in some numbers. Variable also in the ground colour and general tone of colour of the fore wings, from silvery whitish-grey to deep slate-grey, brown-grey, and purple-grey. A specimen taken on Dartmoor by Major Still in September 1894, and now in Mr. Hanbury's collection, is of a very rich velvety-black, with the Y-mark conspicuously silvery-white — a most remarkable example. Another almost as unusual, in the collection of Mr. Sydney Webb, has the silver Y reduced to a V.

On the wing at apparently all times of the year—even sometimes emerging in December and January—but common in the spring and early summer, and most abundant towards autumn, being sometimes to be seen in myriads in August.

LARVA attenuated in front, the ordinary raised dots emit long pale bristles; it loops in walking, possessing only twelve legs; head small, rounded, shining, pale green with a conspicuous black dash on the outside of each lobe; body velvety, pale or dark green, pulsating dorsal line darker, edged on each side by a very sinuous white thread; sub-dorsal line also much waved, dark green; between it and the white edging of the dorsal line is a broad whitish shade; spiracular line distinct, whitish or yellowish, margined above by a darker shade of the ground colour; usual spots distinct, whitish surrounded with green; undersurface slightly darker

than the ground colour, irregularly and sparsely dusted with white; legs brownish, their bases black; prolegs green tipped with ferruginous. Extremely variable, from bright light green almost to black. A variety found in some numbers in Kent by Mr. Charles Whitehead, of Maidstone, from which were reared the small form of the moth already mentioned, is thus described by Mr. G. T. Porritt: "Length when full grown about one inch. Ground colour dark olive-green, in one specimen nearly black; head and legs intensely black and shining; two very fine, interrupted, almost inconspicuous yellow lines extend through the dorsal region, followed outside by a broad, bright yellow, double subdorsal stripe, the outer of the two being narrower than the inner; spiracular stripes also broad and light yellow; raised dots large and distinct, black, surmounted by a pale greyish-yellow spot, though these paler spots are less conspicuous on the lateral than on the dorsal dots; spiracles greyish-yellow, narrowly edged with brown; bristles grey, short, and stiff; ventral surface dark olive-green, the prolegs having on the outside a large cup-shaped black mark.

In the greatest abundance in the summer and early autumn, apparently not confined to any season, but in continuous broods. On almost every description of low-growing plant, and sometimes very destructive to clover, peas, and other green crops. It has even been reared upon the leaves of lime-trees and the green pods of scarlet-runner (*Phaseolus*).

PUPA rather slender, with a conspicuous tongue-case projecting down over the front of the abdomen; black-brown or pitchy-black, but it has been found of a green colour, remaining so almost till the emergence of the moth. In a white silken cocoon, which is semitransparent, under a leaf, or among vegetable débris.

The moth sits by day on all sorts of low-growing plants, but particularly upon heath and the stiffer herbaceous plants, and usually head downwards, but is excessively restless, flying

off at the least disturbance if the weather is at all fine. But on warm days it also flies most actively, of its own accord, in the sunshine, and sips the honey from blossoms of clover, thistle, thrift, honeysuckle, and any other attractive flowers. In the colder districts it will even bask in the sunshine on walls and rocks. At early dusk it is again upon the wing and comes into gardens, where it revels in the flowers of sweet william, *Phlox*, *Tropæolum*, *Nicotiana affinis*, virginia stock, and every other flower from which honey is obtainable. Later at night it comes, very much more rarely, to light, and has even been known to hover at the sugar placed on trees. Its powers of flight are considerable, its migrations extensive, and apparently more frequent than those of any other species. It is a common occurrence to find it quite suddenly in multitudes in every field where, the day before, not a specimen was to be seen, and where no traces of the ravages of its larva had existed. This is so especially the case along our coasts that no other explanation than migration can well be accepted. Indeed, it has been observed by Mr. R. South. and since by others, that on a hot still evening moths of this species will rise from grass or corn, perpendicularly, until lost to sight, very much as though for a distant flight. I well remember an instance in Pembrokeshire when the extensive warrens of the coast suddenly became enlivened with this species to such an extent that thousands were to be seen buzzing in the daytime around the large patches of blooming thistles. At sea it has been observed to come on board vessels in such multitudes that when they alighted they are described as clustering in masses all over the ship. Moreover, Herr Gatke compares to "snowstorms" the vast flights of this species which were observed in 1882 at Heligoland "all going west." Thus this species is altogether irregular in its appearances, but is found more or less plentifully throughout the three kingdoms to the Shetland Isles; also all over the rest of Europe; India, Persia, and all Northern Asia; most abundantly in Morocco and the remainder of

Northern Africa; and in North America through Canada, the Hudson's Bay Territory and California. Indeed, the form known as *P. ou*, which is probably only a darker variety with a smaller Y, is found in Colorado, Oregon, Texas, Florida, Missouri, Nebraska, and even New York. Although so widely distributed, the range of the present species seems to be wholly on the north side of the equatorial regions; among vast numbers of insects collected promiscuously for me in South Africa not a single specimen of this species has been received; its place there seems to be taken by *P. circumflexa*, *P. eriosoma*, and other allied species.

10. **P. ni**, *Hüb.*—Expanse $1\frac{1}{4}$ inch. Fore wings short, broad behind, rosy-grey, or yellow-grey, much marbled with dark brown; the central Y silvery-white, broad and complete. Hind wings pale smoky-brown shading darker behind. Lateral tufts of the abdomen yellow-brown.

Antennæ of the male simple, almost naked, pale brown; eyes naked, black-brown, lashes brown, distinct but nearly prostrate, palpi short, broadly tufted, pale brown clouded with darker; head pale brown, a broad tuft of long scales flattened down lies, pointed forward, between the antennæ; collar light brown, faintly barred twice with darker and whiter in alternate bands; remainder of the thorax grey-brown dusted with dark brown and white; crests prominent, whitish, the long scales thickened and flattened at their tips, which are dark brown; fascicles long, smoky-white; abdomen brown, its basal portion covered with long smoky-white hair-scales, the dorsal ridge ornamented with three large pale brown crests, which are barred and tipped with dark brown; these are somewhat fugitive; lateral tufts tawny or yellow-brown; anal tuft grey-brown. Fore wings rather triangular, costa straight to near the apex, which is bluntly rounded, almost angulated; hind margin rather straight, but curved off at the anal angle and a little crenulated; dorsal margin concave and gracefully curved; colour grey-brown shaded

with golden-brown, or yellow-grey or rosy-grey marbled with dark brown; basal line faintly indicated by two small blackish curves; first line curiously placed, its dorsal extremity not far from the base and leaning outwards, incomplete but double, golden brown enclosing a whitish line; second line obscure but duplicated, straight, reddish-brown, enclosing a faint white thread; subterminal line a series of black angles, some of them almost right angles, partially edged outside with white, and those above the middle having on their inner side long black wedge-shaped streaks; orbicular stigma altered into an elongated loop with a whitish edging; touching it, but below the median nervure, is an oblique thick silvery-white Y-shaped spot occasionally divided into two, the upper U-shaped, the lower round and nearly touching the second line; at the extreme hind margin are two very slender parallel white lines; cilia rich brown, dusted with whiter. Hind wings rather long and ample; dull brown, paler at the base, but with brown nervures; cilia white. The female has broader fore wings, which are less suffused with golden brown, the markings more sharply defined, and the silvery spot or spots a little broader; the tawny colour is obscure on the lateral tufts but extends to the underside of the anal tuft.

Underside of the fore wings pale drab, obscurely clouded with pale brown; nervures darker. Hind wings dusky white, abundantly dusted with brown, less so toward the base. Body and legs grey-brown, the tibiæ of the latter black-brown barred with dull yellow.

Apparently not variable beyond the degree already mentioned, except that there is some reason to believe that the second generation is darker than the first.

On the wing in May, and as a second generation in August and September.

LARVA like the rest, having only twelve legs; head small and rather flattened; body tapering and becoming largest at

the anal segment, which, however, is very abruptly cut off behind; colour semi-transparent pale green or yellow-green; dorsal line slender, white; subdorsal similar; spiracular stripe broad, white; spiracles black; raised dots white, with a dark hair.

June and July, and doubtless in April, but we have little information; on cabbage, turnip, nettle, lettuce, celery, tomato, and other herbaceous plants.

PUPA yellow-brown, enclosed in a slight cocoon. Not further described.

The moth flies in the daytime about flowers, or if the weather is dull rests head downwards upon a plant or in a tuft of rushes; at dusk it flies more freely, and while on the wing can only be discriminated from *P. gamma* by its greyer colour. It is very little known here, and is apparently one of our rarest species, but there are rumours that it is not so scarce in the far west of England. The first specimen recorded in this country was captured flying about blossoms of red valerian by Mr. D'Orville in his garden at Exeter in August 1868. The next was taken by Miss Carne, of Penzance, hovering at flowers in her garden in May 1869, and was recognised by Mr. W. R. Jeffrey, in whose collection it still is. Of further captures in the same district, in both imago and larva state, definite information has been refused. The third recorded specimen was taken in Dorsetshire by Mr. Nevinson in 1885, and the fourth at the Isle of Portland, in the same county, in September 1888, by Colonel Partridge, to whose lamp it was attracted while he was sugaring. In 1894 Mrs. Richardson found two larvæ in the same locality, from which the moths were reared early in September; and in the same year Mr. C. A. Briggs was allowed to exhibit two of the mysterious Cornish examples. The last of which I have any reliable information is a specimen taken sitting upon a fence at Norbiton, Surrey, in May 1896, by Mr. Percy Richards; but there is a specimen in Dr. Mason's collection

which may safely be held to be British, since it was found, overlooked, among a lot of the allied *P. gamma* in a British cabinet. Thus its range with us, so far as known, is confined to Dorset, Devon, Cornwall, and Surrey. Abroad it has a wide range through Southern Europe—very common in Italy—Hungary, Carniola; Algeria and other portions of Northern Africa to Aden; Asia Minor, Syria especially, Armenia, India, China, Japan, the Cape de Verde Islands, St. Vincent, Haiti; and apparently in North America (under the name of *P. brassica*), throughout the United States, and in Canada.

11. *P. interrogationis*, *L.*—Expanse $1\frac{3}{8}$ to $1\frac{1}{2}$ inch. Fore wings silvery-grey, abundantly marbled and rippled with velvety-black; usual Y-spot short and thickened. Hind wings yellow-brown with a dark hind-border.

Antennæ of the male simple, minutely ciliated, light brown; palpi short, broadly tufted and extremely hairy, the stiff hair-scales bristling in front, dark purple-brown mixed with white; eyes black-brown, naked, thickly surrounded by long dark lashes; head purple-black, densely tufted, with longer tufts between the antennæ, but with the transverse channel indistinct; thorax pale purple-brown repeatedly barred with black and white on the collar, shoulder lappets, and crest, which last is large and broadly tipped with white; fascicles dusky yellowish-white; abdomen yellowish-grey, basal portion covered with long paler hair-scales; dorsal ridge ornamented with three or four black crests tipped with white, the third the longest; lateral and anal tufts rather compressed. Fore wings narrow, the costa almost straight; apex bluntly angulated; hind margin oblique, crenulated, and faintly curved; anal angle prominent and rather produced; dorsal margin hollowed and gracefully curved; colour rich, silvery, purplish-grey, clouded and stippled with black; basal line double, composed of black curves edged outside with white; first line a series of silvery-white crescents and angles, edged on both sides with deep black; second line

more direct and oblique but obscurely similar; subterminal line a series of deep black angles and irregularities partially clouded inside with black, and extending from the anal angle to the costa before the apex; before and behind this the surface is dappled with silvery-white; orbicular stigma irregularly formed, open below, bordered with white, its lower margin opened so as to extend below the median nervure, and there join an irregular brilliant silvery **U**-shaped marking, which usually is followed by a similar round spot, forming a broken **Y**; reniform stigma upright, outlined with cloudy-black and partially with a very slender silvery edging; the portion of the wing from the stigmata to the dorsal margin blacker than the rest; extreme hind margin edged with a black line, and inside this by a row of elongated white dots backed by black crescents; cilia dusky-white dusted with black-brown. Hind wings rounded, smoky brownish-white clouded with darker; nervures dark brown; hind-marginal region broadly bordered with a smoky-black band which shades off inwardly; cilia white, dashed with dark brown. Female extremely similar.

Underside of the fore wings dull smoky-brown with two faintly darker transverse stripes, one in the middle, the other near the hind margin; cilia white, broadly dashed with smoky-brown. Hind wings smoky brownish-white dusted with brown, with a slender darker brown transverse stripe in the middle and a broad one along the hind margin. Body silvery whitish-brown; leg tufts smoky-brown; tibiæ black-brown much barred with white.

Usually only variable in the depth of the black clouding and in the shape of the **Y**, which is very irregular. In a specimen in the collection of Mr. A. C. Vine it is produced into a long attenuated and enlarged stripe of rich gold colour toward the base of the wing. Those taken at Londonderry by Mr. Milne have a beautiful flush of purple over the fore wings.

On the wing at the end of June and in July.

LARVA rather elongate, slightly attenuated in front and swollen behind, having a few scattered dark bristles; head rounded and shining, green dusted with purple; body dull grass-green with a blackish tinge on the sides and under-surface; dorsal stripe of the ground colour, distinctly edged with white, these white lines converging on the third segment; subdorsal line white, and between these runs an irregular whitish thread-line; spiracular stripe conspicuous, pale yellow or yellowish-white; raised dots white; legs and prolegs tipped with purplish-grey. When young all the pale markings are yellow or yellowish. (C. Fenn.)

September to June on heather (*Calluna vulgaris*), whortleberry (*Vaccinium myrtillus*), and *V. uliginosum*.

PUPA elongate, tapering, a projection or elongation of the tongue-case lies above the front of the abdomen; anal extremity hooked; colour dark pitchy-brown, the incisions of the segments tinged with green. In a thin cocoon of white silk among heather twigs.

The moth sits in the daytime head downwards upon the stems of heather on heaths and moors, especially the dead stems of burnt heather, or occasionally upon some other plant, or even on a stone or rock or stump of a tree, or even upon a stone wall, and is very restless, flying swiftly away if disturbed, to settle again at a short distance. Occasionally it will fly to flowers in the hot sunshine, and its movements then are very wild and swift. Its ordinary flight, however, is at dusk, when it visits the blossoms of honeysuckle, wood-sage, privet, and the "melancholy" thistle (*Carduus heterophyllus*). A species of northern distribution, attached to heathery mosses, moors, and mountain sides, yet found on rare occasions in most unexpected places, as, for instance, a specimen which was secured at Battle, Sussex, in 1870, by Mr. J. H. A. Jenner, and exhibited soon after at a meeting of the Entomological Society of London; and another by Mr. A. Robinson on a gas-lamp at Cambridge; while two

were recorded in Devonshire many years ago. Apparently the most southern locality in which it is known to have been a constant resident is Cannock Chase, Staffordshire, where it was at one time common; and from this place going northward it is found occasionally on the Pennine and other hills in Shropshire, Cheshire, Lincolnshire, Yorkshire—where also it frequents the moors in various localities—Lancashire, Westmoreland, Cumberland, Northumberland, and Durham. In Wales the only locality on record appears to be in Radnorshire, though surely it must occur elsewhere. In Scotland it seems to frequent suitable spots throughout the country, and often commonly, from Berwick to Sutherland and Argyle, including Arran; but otherwise I find no record from the Isles. In Ireland it is found in Westmeath, Galway, Sligo, Fermanagh, Roscommon, Tyrone, and Londonderry, and according to Mr. Kane is common on many heathy moors and hillsides.

Abroad it seems to have a somewhat more southern range, occurring in mountain regions in many parts of Central Europe, as well as Northern Europe, North Italy, the Ural Mountain district, Eastern Siberia, and Tartary; apparently also in Canada, Nova Scotia, and the Hudson's Bay Territory, but under the name of *P. octoscripta*.

Genus 87. **HABROSTOLA.**

Antennæ nearly naked, slender, simple; palpi rather short, ascending; tongue long; eyes naked, having front and back lashes; thorax strongly crested and usually having black ovals on the collar; abdomen ornamented with several crests; fore wings somewhat triangular, without metallic markings but provided with ridges of raised scales on their surface; hind wings broad, plain, the cross-bar slender, angulated, vein 5 arising below the middle and rather curved.

LARVÆ with sixteen legs, but the first pair of prolegs less developed than the remainder ; the twelfth segment swollen.

PUPÆ with but a small ventral projection ; in a silken cocoon.

We have but two species, readily discriminated.

A. Ground colour of the fore wings silvery-grey.

H. urticæ.

A². Ground colour of the fore wings yellow-brown.

H. triplasia.

1. **H. urticæ**, *Hüb.* ; **tripartita**, *Staud. Cat.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings moderately broad behind, blunt, silvery-grey, with a very broad dark brown transverse band in the middle, ornamented with raised black lines. Hind wings smoky-brown. On the collar are two oval silvery-grey spots ringed with black.

Antennæ of the male simple, almost naked, grey-brown, dotted at the base with white ; palpi slender, almost erect but hardly extending above the head, black frosted with white ; eyes brown-black, the front and back lashes very long and curling over ; head blackish-brown, very strongly tufted, the face covered with an erect tuft which is separated by a deep transverse channel from another above the antennæ ; collar silvery-grey, divided distinctly into halves by a black-brown bar, and each half ringed with black-brown in such a manner as to present a most curious resemblance to a pair of spectacles, each ring being flattened and hollowed so as to increase the similarity ; shoulder-lappets greyish-white ; remainder of the thorax occupied by a large erect curved and hollowed crest, light brown in front and above, greyish-white at the back ; fascicles broad, white ; abdomen dusky grey-brown, the basal segments covered with long dusky white hair-scales ; dorsal ridge brown-black ; upon it, on the third segment, is a large erect expanded black-brown crest followed by a smaller oblique one and faint indications of

two more; lateral tufts broad, ashy-brown; anal tufts small, brown. Fore wings somewhat triangular, not very broad, blunt behind; costa nearly straight; apex bluntly angulated; hind margin rather rounded, full in the middle, and not very oblique, faintly crenulated; dorsal margin nearly straight; colour silvery-grey, broadly banded and clouded with blackish-brown; first line much curved, red-brown edged with purple-brown and closely followed by a parallel line of deep black upraised scales; second line gently curved but not indented, pale chocolate, preceded by a parallel line of raised deep black scales most conspicuous on the dorsal region; the space between the first and second lines forms a broad central purplish-grey-brown band in which are short lines of distinctly raised deep black scales forming the anterior and posterior edges of the spaces which should be orbicular and reniform stigmata, and of a similar space obliquely below the median nervure, in this last case the black ridges being bordered inwardly with white; at the apex of the wing is a small oblique black dash faintly intersected by a whitish commencement of the subterminal line, which otherwise is merely the border of a purplish-brown cloud along the hind margin; this extreme margin is edged by a sinuous black line, outside which the cilia are long, pale purplish-brown with a smoky clouding. Hind wings rounded, smoky purplish-brown, rather paler at the base but the nervures dark; cilia white, clouded with brown. Female quite similar.

Underside of the fore wings dull purple-brown, with four white spots on the costa toward the apex. Hind wings smoky-white with brown nervures to the middle, thence smoky-brown; central spot dull black; cilia white clouded with brown. Body and legs very dull brown, front tibiæ blacker.

Usually not variable, but a specimen in the collection of Mr. W. H. B. Fletcher has the ground colour, as shown near the base and hinder part of the fore wings, dark steely-grey;

and Mr. J. Gardner possesses one in which the fore wings are of a curious unicolorous slate-brown, except that the portions usually pale are shining slate-grey.

On the wing at the end of May and in June, and occasionally as a second generation at the end of August.

LARVA elongate, tapering considerably in front, first pair of prolegs ill-developed and not used in walking; twelfth segment swollen, and having two dorsal points united by a curved line; fifth, sixth, and seventh segments arched; head large, rounded, dull green, slightly polished, a grey dash in the middle of each lobe, and a whitish projection on each side of the mouth; body furnished with a few scattered short hairs; colour pale green, with a series of dark green >-shaped dorsal markings, of which the apex is behind, most distinct from the fifth to the twelfth segments; these markings are broadly edged on both sides with white; dorsal line green, contained in a white loop inside each of the above markings; subdorsal line, and a line below it, whitish, threadlike and indistinct, except on the four anterior segments; spiracular stripe conspicuous, white, bordered above with dark green, and joined to the white edging of the dorsal markings by vertical white dashes; a row of oblique dark green dashes lies upon the sides and prolegs beneath the spiracles; under-surface yellowish-green irrorated with grey or darker green, and furnished with a rather paler central stripe; legs dark brown ringed with paler brown. It loops in walking. (C. Fenn.)

July, sometimes August and September, on stinging nettle (*Urtica dioica*), feeding at night; resting during the day on the underside of the leaves, to which it so closely assimilates in colour as to be difficult of detection. Hofmann says that it is rather gregarious.

PUPA of the usual noctua form, except that the tip of the tongue-case is raised and forms a knob in front of the abdomen, the points of the wing-covers running into it; the

covers of the tongue and limbs are also thickly sculptured with rather coarse, cross, incised channels and lines, and the wing-covers more thickly and minutely ornamented with irregularly-placed lines; while the dorsal region and all the segments are dull from close pitting of fine punctures, except the hinder edge of each abdominal segment, where is a narrow, shining smooth band, ridged behind; colour chestnut-red; dorsal region a little darker; cremaster also rather darker, elongated, and tapering, but flattened and very rough, the tip furnished with several strongly-hooked bristles by which it fixes itself very firmly in the cocoon. This is formed of tough silk, covered with earth, and is placed on, or under, the surface of the ground.

The moth sits during the day on palings or among herbage, and is not known to fly except at dusk, and at night, when it frequents the flowers of red valerian (*Centranthus ruber*), the various species of *Silene* and *Lychnis*, nettle, honeysuckle, and raspberry. Especially fond of garden-flowers, and formerly to be taken in gardens in the outskirts of London; from these it has of late disappeared, but continues to be found, though generally in but moderate numbers, all over the southern half of England, including the Scilly Isles, and is common in Norfolk and some other counties. In the Midlands very local, but recorded in Leicestershire, Staffordshire and Derbyshire; also in Herefordshire, Cheshire, Yorkshire, rarely in Lancashire, more frequently in Durham, Northumberland, Westmoreland, and Cumberland. The only record that I find in Wales is at Barmouth; but in Scotland it has a wide range, being found near Hawick, in Roxburghshire, near Bonhill in Dumbartonshire, Ayrshire, Perthshire, Kincardineshire, Aberdeenshire, Moray, Ross-shire, and the Orkneys; and in many other places in the more southern portions of that country. In Ireland it appears almost to be generally distributed, since it is recorded from Dublin, Wicklow, Louth, Westmeath, Carlingford, Monaghan,

Galway, Sligo, Fermanagh, Tyrone, Armagh, Donegal, Antrim and Londonderry. Abroad it is found throughout Central Europe, the temperate portions of Northern Europe, the South of France, the North of Italy, the Balkan States, Southern Russia, Eastern Siberia, and the mountainous regions of Central Asia.

2. **H. triplasia**, *L.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings rather blunt, blackish-brown; base, and a band before and beyond the middle, chocolate-brown; on the transverse lines and central markings are some deep black raised scales. Hind wings smoky-brown, with the base, except the nervures, paler. Spectacle marks bright light brown.

Antennæ of the male simple, minutely ciliated, brown; palpi rather slender, curved up, and rising slightly above the head, black-brown, lower portion furnished with projecting tufts of straight black scales, that on the second joint so pointed as to make each palpus appear forked; eyes brown-black, with long, curled over, front and back lashes; head roughly tufted with erect scales, black-brown, a deep cross-channel below the antennæ cuts off the upper portion, which is narrow and sharply ridged; collar broad, bright light brown, divided and bordered with black-brown, and within so clouded as to simulate a pair of spectacles; remainder of thorax pale purple-brown, except a very large crest which occupies the middle area, and is tall, most conspicuous, and of a pale yellow-brown; fascicles yellowish-white; abdomen dark smoky-brown, the basal segments covered with long yellowish-white hair-scales, and the dorsal ridge furnished with a series of black-brown crests, of which the third is by far the tallest and most conspicuous; lateral tuft spreading; anal tuft small. Fore wings not broad, bluntly pointed; costa very faintly rounded; apex bluntly angulated; hind margin gently rounded and very obscurely crenulated, but hollowed above the anal angle; dorsal margin very slightly filled out; colour black-brown; the basal space dull yellow-brown with

an outer edge of purple-red which is bounded by the curved and sinuous deep black first line ; second line also deep black in the dorsal half, broadened and much curved, but obscure above the middle ; in both lines the scales, more especially in the *deep* black portions, are tilted or upraised, and in the second are edged on both sides with purple-red clouding, much shaded off near the anal angle into a patch of purplish-white ; from this springs the subterminal line as a series of pinkish-white streaks and angles, and from it, near the apex of the wing, three deep black streaks pointing inward ; orbicular and reniform stigmata very large, only indicated by interrupted edgings of deep black upraised scales ; beneath these are similar, or more conspicuous, raised margins, and a similar rounded spot : extreme hind margin edged by a deep black line ; cilia smoky-brown. Hind wings rounded, smoky-brown, except a patch of smoky-white at the base ; nervures black-brown ; cilia white, clouded with brown. Female quite similar.

Underside of the fore wings unicolorous smoky-black. Hind wings smoky-white to the middle, with the central spot black, and much smoky dusting toward the costal margin ; beyond the middle the whole area is occupied by a broad smoky-black band, ill-defined on its inner margin ; cilia white with smoky clouding. Body dusky white with smoky-black lateral tufts ; legs dusky white, the tibiæ black-brown.

Hardly variable, except that its colours are rather darkened in more north-western districts.

On the wing in June and July, and occasionally, though rarely, in a second generation at the end of August or beginning of September.

LARVA provided with sixteen legs ; smallest at the head, increasing in size to the fifth and sixth segments, which are swollen, those following being almost cylindrical to the twelfth, which is raised and furnished with two dorsal points connected by a raised line ; anal segment sloping at an

extreme angle. Head small, rather flattened, blackish-brown, legs similar; body dull green irrorated with white; dorsal line white upon the first four segments, slightly darker beyond; there is a row of curved darker dorsal markings, faintly edged with white from the fifth to the twelfth segment, these curve behind and bisect the dorsal line; on the fifth segment are two lemon-yellow blotches connected by a >-shaped whitish line pointing backwards and joined in front to a curved white line from the head; the enclosed spaces velvety dark olive-green; on the sixth segment is a similar curved line clouded with velvety olive-green, uniting two white dots; on the apex of the twelfth segment is a dark olive-green blotch, margined behind by a whitish line which unites two white raised dots; another whitish line runs laterally from the first pair of dorsal spots on the twelfth segment to the anal prolegs; spiracular line rosy-grey, emitting a series of oblique pale streaks below the spiracles, which are white; usual spots white in dark grey rings; the sides from the head to the sixth segment shaded with dark olive-grey; on each side of the fifth segment is a small whitish blotch.

A variety, having the same pattern of markings, has the ground-colour bright reddish-purple with pinkish cream-coloured markings in place of the yellow and white; the oblique lateral stripes and the three dorsal blotches are rich deep brown. All the legs are used in walking; in repose the fifth and sixth segments are arched, and the anal segment raised. (C. Fenn.)

End of July till September on stinging-nettle and hop, resting by day on the undersides of leaves, and feeding at night.

PUPA tapering at each extremity, the front portion swollen into a rather long hooked projection; deep dark purplish-red, covered with a slight bluish efflorescence, which, when removed, causes the abdominal segments to appear red.

Enclosed in a compact silken cocoon lined inside with brown papery-looking silk, among leaves or rubbish on the surface of the ground. (C. Fenn.) The winter is passed in this state.

The moth sits occasionally on palings or posts in the day-time, but more generally among herbage, and is never, I think, known to fly at that time either voluntarily or from being disturbed. It flies actively at dusk, and is strongly attracted by the flowers of red valerian (*Centranthus ruber*), nettle, honeysuckle, *Silene* and *Lychnis*, and by any suitable cultivated flowers, being especially fond of gardens. Thirty years ago it was quite common in the outskirts of London, and might be found on any fine June evening in the gardens at Camberwell and Peckham. Even yet a specimen may occasionally be seen, and one came into the room in which I am writing last summer, evidently attracted by the light. Rather rare on the coast of Kent and in the south-west corner of the kingdom, but otherwise found throughout the southern half of England, and often rather commonly; scarcer and more local in Norfolk and the northern Midland Counties; and to be met with in Herefordshire, Cheshire, Lancashire, Yorkshire, and Cumberland. In Wales the only record of which I am aware is my own at Pembroke, where it was very scarce. In Scotland it is found in Ayrshire and other parts of the Clyde Valley, also in the districts of the Solway, Tweed, and Forth, and in Kincardineshire. In Ireland it is more widely distributed and much more plentiful, being found in the counties of Galway, Sligo, Carlingford, Monaghan, Westmeath, Louth, Armagh, Antrim, Donegal, and Londonderry, and also in the extreme south-west, in Kerry. Abroad its range is over the whole of Europe, except the extreme north, Northern Africa, Asia Minor, Persia, and Siberia.

Genus 88. **CHARICLEA.**

Antennæ ciliated ; palpi short ; eyes naked, without lashes ; head very blunt ; thorax faintly crested at the back ; abdomen rather short, having a crest on the basal segment. Fore wings short, rather truncate, richly coloured and with conspicuous transverse lines or bands ; hind wings broad, the cross-bar oblique and very slender, veins 4 and 5 parallel.

Two species are known here, but one of them only by ancient records. They bear no resemblance to each other.

A. Fore wings orange-yellow, banded with purple.

C. marginata.

A². Fore wings brilliant purple-pink banded with darker.

C. delphinii.

1. **C. delphinii**, *L.*—Expanse $1\frac{1}{4}$ inch. Fore wings rich brilliant purple-pink ; transverse lines darker and shaded with brown ; hinder area lilac or pale crimson ; reniform stigma dark purple, large and irregular. Hind wings white with a broad smoky-brown band.

Antennæ of the male simple, minutely ciliated, pale drab ; palpi short, moderately tufted, orange-red ; eyes naked, red-brown ; head densely tufted, the lower portion with incurved scales, pale yellow shaded with orange-red, divided by a channel from the upper portion, which is pale reddish-drab ; underneath the base of each antenna is a pointed white tuft ; collar large, not peaked, but rather pointed forward in the middle, pale drab barred with red-brown ; remainder of the thorax drab, the shoulder-lappets edged with tawny ; top crest small, placed in the middle of a tawny cross-bar ; back crest larger, of the same colour but divided ; fascicles yellowish-white ; abdomen rather short, pale brownish-drab ; a small tawny crest on the basal segment ; lateral tufts purple ; anal tuft purplish-white. Fore wings rather short, costa straight almost to the apex, which is bluntly angulated ;

hind margin below it straight and nearly perpendicular, but below the middle suddenly bent in to the anal angle; dorsal margin straight; colour rich glowing purple-pink disposed in bands with brown shades; first line forming a rather full curve, indented at the nervures; purple-brown, shaded off inside, but outwardly sharply defined by a pink-white edging; second line faintly scalloped near the dorsal margin, thence making a bold sweep outward and bending sharply back near the costa, purple-brown shaded off outside, inwardly duplicated by a fine crimson line; the subterminal line forms the outer margin of the purple-pink colouring; outside it the marginal space being white with a lilac or pale-crimson tinge; orbicular stigma only indicated by a white cloud which extends to the costa; reniform large, dark crimson edged with purplish-black, which also extends to the costa; space between the stigmata crimson, and all the central band rippled with lines of the same colour; cilia brownish-white with a faintly browner stripe. Hind wings white to the middle, with the nervures dark brown; hind-marginal region filled up by a broad smoky-brown band in which the nervures are still rather darker; extreme hind-margin tinged with purple; cilia white. Female very similar, rather stouter.

Underside of the fore wings smoky-brown, flushed with purple, and having a broad purplish-white hinder stripe; costa clouded with purple; reniform stigma visible as a blackish cloud. Hind wings white with a broad delicate purple-pink band before the hind margin, and a similar cloud on the costa. Body white, tinged with pink on the sides; legs and tufts white, similarly tinged in front.

On the wing in May and June.

LARVA slender, violet-grey with an interrupted black dorsal line bordered on both sides with yellow, and with four large black dots on each segment; on each side paler, with a broad yellow band above the feet, above which stand five large black dots on each segment; head round, yellow, with three

large black dots and a black hind border to each hemisphere ; front triangle black ; dorsal plate also black, divided in the middle by a yellow cross line ; anal plate yellow, dotted with black.

July and August, on the flowers and seeds of larkspur (*Delphinium consolida*) on fallow land. (Hofmann.)

PUPA with a wart-shaped projection on the head ; red-brown with greenish wing-covers. In an earthen cocoon deep in the ground. (Hofmann.)

The habits of the moth are not known to me, nor am I aware of any instance of its capture in this country for a very long period. Haworth (1803) stated that it was found in gardens, and that five specimens had been recorded in England. In the Transactions of the Entomological Society (1807) he goes more into particulars. Treating of the work of Benjamin Wilks (1773) he says, "He likewise delineates in the most charming and complete manner, giving all its phases from the egg to the wing, the lovely *Noctua Delphinii*, Fab. (Pease-blossom moth), along with its favourite food the wild larkspur ; and says that 'it has been bred in England by the Honourable Mrs. Walters, and by Nathaniel Oldham, Esq., but that it is very rare.' A wing of this beautiful moth is said to have been found in a spider's web at Bulstrode, by that great patroness of Natural History, the late Duchess of Portland ; and another in St. James's Park ; and my friend Mr. Jones, of Chelsea, has a very perfect specimen which he captured in his garden a few summers since. Further than the above instances the species is not known to us as British." Donovan (about 1800) referred to the specimen taken alive in Mr. Jones's garden at Chelsea as establishing the species as British. Stephens (about 1830) stated that specimens in his own collection, and in that of the British Museum, were caught in the neighbourhood of Windsor, about fifteen years earlier, in June ; and Curtis writing about the same date confirms this statement. These appear to be all the records

in this country. In the cabinet of Dr. P. B. Mason the fore wing mentioned by Haworth, and found by the Duchess of Portland, is still in existence, and in good condition; and he has besides two specimens from the cabinet of the late Mr. Edwin Shephard recorded as taken at Windsor, and one labelled "Taken in a clover field near Reading." Mr. C. W. Dale states that he possesses, in the collection of his late father, an example "which appears to be a hundred years old, damaged and without an abdomen; it came out of the collection of old Dr. Lathom."

The above localities are principally in Middlesex and Berks. Abroad it is found in Central, Southern and Eastern Europe, Northern Italy and Sweden; also in Asia Minor.

This appears most distinctly to indicate a species which, so far as this country is concerned, has died out since the beginning of the present century.

2. *C. marginata*, Fab.; *umbra*, Staud. Cat.—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings orange-yellow; nervures, lines, and edges of the stigmata rust-red; space beyond the second line frosted with purple. Hind wings pale yellow, with a large black central spot, and a broad black hind-marginal band edged outside with orange-red.

Antennæ of the male simple, regularly ciliated with minute tufts of white bristles, otherwise orange-brown; palpi rather short, closely tufted, tawny; eyes naked, leaden black; head thickly but smoothly tufted in front, and with a small projecting tuft above, tawny; thorax of the same colour, rather smooth but the collar a little pointed forward in the middle; back crest obscure, tipped with chestnut; fascicles pale yellow; abdomen orange-brown, paler at the base, the long hair-scales pale yellow, but on the dorsal ridge of the first segment gathered into a loose crest, coloured chestnut at the tip; on one or two more segments a clouding of similar colour suggests an additional crest; lateral tufts spreading; anal tuft rather compressed. Fore wings broad behind and

rather truncate; costa nearly straight; apex bluntly angulated; hind margin faintly hollowed below it and then filled out, very little oblique except where rounded off to the anal angle; dorsal margin straight; colour orange-yellow with all the nervures distinctly tawny; basal line incomplete, angulated, first line complete, repeatedly angulated, both slender, rust-red; second line very oblique, direct and almost straight, but bent sharply back close to the costa, purple-red, and forming the inner margin of a broad frosted orange-purple stripe or band which occupies the hind-marginal space and contains the subterminal line—irregular, indented, tawny, and shaded outside with orange-yellow; orbicular stigma round, a distinct slender tawny ring; reniform stigma broad, with a slender tawny margin, and containing a faint cloud of the same colour, it is invaded and cut by a distinct, angulated, rust-red transverse line which represents the usual central shade; cilia orange-purple. Hind wings glossy pale yellow, with the nervures, a large clouded central spot, and a broad band beyond the middle, all smoky-black; extreme hind margin orange-red; cilia white. Female very similar in all respects.

Underside of the fore wings yellow, shading paler toward the dorsal margin; a black streak arises at the base; orbicular and reniform stigmata both indicated by smoky-black spots; beyond them is a very broad similar transverse stripe; cilia purple. Hind wings yellowish-white dusted with purplish-orange along the costal region; clouded with purplish-brown beyond the middle; central spot obscure, smoky-black. Body pale purplish-brown, legs purplish-orange, tufts paler.

Not very variable, but the ground colour ranges from orange-yellow to pale yellow, and the outer dark band from purple-red to purple-grey. On the east coast of Scotland, where it occurs very locally, the ground colour is more dull and is clouded in some degree with reddish-brown.

On the wing from the end of May to the beginning of July.

LARVA elongate, cylindrical, not attenuated; head rounded and shining, reddish-umbreous; horny shining yellowish-brown plates on the second and anal segments, the former edged with black; general colour grey, irrorated with white, dorsal stripe broad, dark grey distinctly edged with white; subdorsal line less conspicuous, whitish tinged with reddish-brown; space between tinged with bronzy-brown and containing a thin white waved thread; spiracular stripe broad, lemon-yellow, edged above with white; above it is a stripe of a shade similar to the dorsal; raised dots black, shining and distinct, those on the sides edged with white; spiracles inconspicuous, dark grey; legs and outside of the prolegs black; ventral shade dull pale green.

Or, black irrorated with whitish or yellowish; a broad dorsal stripe of the ground colour edged on each side by a whitish line; subdorsal line distinct, yellow shading toward white at the incisions; between these lines is a whitish interrupted thread; spiracular stripe yellow, very conspicuous, shading into white at its upper edge; undersurface dark green with broadly paler central shade; head dull brownish yellow or amber; spiracles black; raised dots, legs, outside of prolegs, and dorsal and anal plates shining black.

Or, similar to the last, but the yellow lines replaced by white.

Or, pale green irrorated with white; dorsal stripe dark greenish-grey; subdorsal white, distinct; spiracular yellowish-white edged above with black; sides otherwise dusky greyish-green; spots shining black, the lateral often ringed with white.

When very young semitransparent pale green; head yellowish, spots shining black. (Chas. Fenn.)

July and August on restharrow (*Ononis arcensis* and *O. spinosa*), feeding especially upon the flowers and young seeds; but when young gnawing the undersides of leaves at the top of a young shoot. In confinement it will eat *Polygonum aviculare* and *P. persicaria*, and Mr. F. Norgate, after

finding larvæ on *Ononis*, fed them up upon the green pods of the scarlet-runner (*Phaseolus vulgaris*). The Rev. J. Hellins has placed upon record that he beat out larvæ of this species from birch and hazle, and reared them upon those trees.

PUPA rather elongated, very smoothly rounded and compact, the limb-covers closely laid down; whole surface glossy dark red-brown; sculpture on the wing-covers very faint; segments sparingly pitted round the anterior edge; abdomen regularly tapering; anal segment rather fully rounded; cremaster a large nipple-like projection armed with two long, parallel, tapering spikes. Subterranean, enclosed in a very slight fragile earthen cocoon.

The moth is rarely seen in the daytime, doubtless it hides among herbage; at dusk it comes readily to sugar, and is attracted by the blossoms of *Silene inflata*, *Lychnis*, and other flowers; occasionally it will come, later at night, to a strong light. Not usually a common species, but found in woods, or on chalk hills, in Kent, Surrey, Sussex, Hants, Dorset, Wilts, Somerset, Berks, Oxfordshire, Herts, Cambs, Northamptonshire, Norfolk, Suffolk, and Essex; in Devon and Cornwall more especially on the sea coast; also found in Gloucestershire, Herefordshire, Worcestershire, Salop, very rarely in Derbyshire, more frequently on the coasts of Cheshire, Lancashire, and Cumberland, and sometimes even plentifully on that of Durham; in Yorkshire also on the coast, and inland as well, but very locally. In Wales it has been found on the North and South coasts; in Scotland in Berwickshire; rather commonly on the coast of Forfar; in Perthshire; at Forres, Moray; and elsewhere in the districts of the Solway, Tweed, Forth, Tay, and Dee. In Ireland it seems to be rare, but has been taken in the counties of Dublin, Wicklow, Waterford, Kerry, Galway, Sligo, and Louth. Abroad it has a very wide range through Central Europe, Northern Italy, Sicily, Southern Sweden, Livonia, Southern Russia, Northern Persia, Tartary, the mountainous

regions of Central Asia, Japan, and, in a rather more yellow variety, in India.

Genus 88. **HELIOTHIS.**

Antennæ ciliated ; tongue of moderate length ; eyes naked, devoid of lashes ; thorax smooth, without crests ; abdomen also smooth and not crested ; fore wings somewhat trigonate, the usual pattern of markings obscure, but the reniform stigma large and produced to the costa ; hind wings broad, the cross-bar angulated, vein 5 apparently carried through to the base of the wing.

LARVÆ smooth, of regular thickness, feeding on low-growing plants.

PUPÆ of ordinary form, without ventral projection, in a slight earthen cocoon.

The four species may readily be discriminated.

- A. Fore wings yellow-brown with darker reniform stigma and sub-marginal band.
- B. A black dot at the anal angle. *H. peltigera.*
- B.² No black dot at the anal angle. *H. armigera.*
- A.² Fore wings olive-brown ; hind wings yellow with black markings. *H. dipsacea.*
- A.³ All the wings white, with broad grey-black markings. *H. scutosa.*

1. **H. armigera**, *Hüb.* ; **armiger**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ inch. Fore wings rather blunt, yellow-brown or tawny, with a broad darker band before the hind margin, and a darker reniform stigma. Hind wings yellowish-white with a broad blackish-brown hind border and dark nervures.

Antennæ of the male simple, minutely ciliated, light brown ; palpi small, slender, horizontal, whitish-brown ; eyes naked. deep brown, spotted with black and devoid of lashes ; head

moderately tufted with scales, but more strongly so on the top, pale brown or whitish-brown; thorax similar, very smooth, the long collar-scales laid back to the general surface, no crests, but very faintly collected tufts at the back; fascicles expanded, dirty white; abdomen whitish-brown with a powdered appearance from the abundance of short superficial white hair-scales, and without crests; lateral tufts inconspicuous; anal tuft narrow. Fore wings in some degree triangular; costa nearly straight; apex angulated and rather pointed; hind margin oblique and faintly rounded; dorsal margin straight; colour yellow-brown, brownish drab, or tawny; no basal line, but the first line placed rather near the base, most obscure, partial, or almost obliterated, when visible much angulated, smoky-brown; second line a series of faint smoky-brown crescents edged outwardly by a narrow line of the pale ground-colour; beyond this the whole hind-marginal space is occupied by a broad cloud of darker or redder brown or smoky-brown, or else a broad band of the same occupies the space between the edging of the second line and the subterminal line, which then is visible as a series of faint smoky crescents; orbicular stigma sometimes indicated by a faint smoky cloud or cloudy spot, or by a large pale spot hardly margined with darker; reniform stigma hardly more distinct, but usually enclosing a rather crescent-shaped or ovate black-brown or red-brown spot, very often a reddish cloud surrounds the stigmata, and sometimes a slender reddish transverse thread or two represent the central shade; cilia concolorous. Hind wings broad, rounded, smoky-white, with the nervures and a large central spot cloudy-black; along the hind margin is a broad ill-defined but conspicuous smoky-black cloud or band; cilia white shaded with brown. Female rather stouter but closely similar.

Underside of the fore wings brownish-white or yellowish-white with very conspicuous markings; the orbicular and reniform stigmata and a broad band before the hind margin

being black, but the latter shades into pink toward the apex, the rest of the hind marginal region is often smoky-black. Hind wings white with a broad, rather patchy, smoky-black band before the hind margin, which, like that of the fore wings, becomes purple-pink at the apex of the wing. This rich colour soon fades as the insect becomes worn. Body and legs whitish-brown.

Variable in the depth of colour of the fore wings and distinctness of their markings, the latter sometimes almost filling up the whole wing, in other cases almost absent, leaving the whole surface softly shaded with reddish-brown on a creamy ground.

Here found only in August, September, or October. Abroad having two or more generations in the year.

LARVA when full grown of moderate thickness, attenuating a little to each end; head of the size of the second segment, shining brown, slightly mottled with darker shades; dorsal plate horny and shining as though wet; dorsal and subdorsal area raw-sienna brown with a tinge of green, and pencilled in fine broken parallel lines of yellow and darker shades, varying a little in tone in different individuals; dorsal line slight and interrupted, forming on each segment two slender oblong dark spots edged with yellow; subdorsal line still less distinct, indicated by dark-coloured raised dots, two or three on either side of each segment, each emitting a short bristly hair; spiracular line sharply defined, pale ochreous, edged above by a fine yellow and a dark umbreous line, and below by a white line; legs and prolegs pale ochreous; ventral surface pale grey, with three white lines. (W. H. Tugwell.) Extremely variable; sometimes light green with the raised dots white, and an extremely broad pale yellow or ochreous-yellow spiracular stripe which shades off to white beneath; sometimes dull chocolate or liver-brown with the raised dots either white or black, the dorsal line white, or yellow, or hardly indicated, the spiracular stripe

usually some shade of yellow, or when younger, yellow-brown.

September and October; but abroad, where more than one generation is found in the year, it is said to feed in June and August. Upon very many species of herbaceous plants. Mr. Tugwell fed his larvæ upon scarlet geranium. He says that for the first fortnight they gnaw only the undersurface of the leaves of the food plant, but after this eat holes in the leaves "and no sooner is the hole sufficiently large to admit the head than they crawl slowly through it, only to commence another hole, and repeat the process again and again so as to make the plant look as though riddled with shot. They also now commence to eat holes in the succulent stems and shoots, burrowing quite into the plant, and evince a strong liking for the buds and flowers. When about half grown they become terrible cannibals, eating their companions with a zest and pertinacity quite horrible. They are mean and cowardly, generally seizing their weaker and more helpless brethren when about to cast their skins. As they become full-fed they appear to hold each other in mortal fear; for when touched by another, ever so lightly, they will wriggle, twist, and throw themselves off the plant to escape a fate which they had possibly inflicted on others. They are most troublesome, since it is necessary to isolate them. Yesterday I had three full-fed that appeared to desire to pupate, so I put them into a large case to do so, but presently discovered two of them making another meal off the third, one eating his head, the other his tail. Imagine my disgust! I never met their equals as cannibals. I think they would eat *me* without much ado, at any rate they bit my hand sharply."

It is possible that the geranium used by Mr. Tugwell may not have been a thoroughly favoured food; or that some change of food-plant is desired as the larva grows. Its range of food is very large—common groundsel, especially the seeds, lucerne, wild mignonette (*Reseda lutea* and *R. luteola*), green peas, young pumpkins, *Gladiolus* (boring into

the stems), Indian hemp, tobacco, henbane ; also the ears of maize, devouring both grain and envelope, but hiding itself in the husk ; very destructive to this crop in Illinois, Kentucky, Kansas, and other parts of the United States, as well as in New Zealand. But in the United States it is even more mischievous to the cotton crop, and is—from its habit of boring into the seed-pod or boll—there well known as the boll-worm. Long reports upon its destructiveness appear in the papers issued by the Departments of Agriculture of various States, and in some years its ravages have caused great alarm. A careful observer in Texas says : “ There is one other insect that has destroyed more cotton in this locality within the last four years than all other insects combined. The moth deposits eggs by piercing the square at the base of the bud. The egg hatches in a few days and the worm devours the young boll before it fairly blooms. Then it crawls upon the limb to another boll, bores in and eats out the contents, then to another, and so on, until all, or nearly all, that are upon the stalk are destroyed. Its numbers are increasing so rapidly and its destruction is so great that it is becoming a terror to cotton planters in this locality.” (It is hardly necessary here again to point out that the *worm* of American writers is the caterpillar, or, as we usually say, the larva.) In the cotton district there appear to be several generations in a season, the first brood of moths appearing in May, and the larvæ sometimes feeding up, from hatching to full growth, in twenty days ! Professor Comstock’s report (1879) furnishes an enormous mass of information which I am quite unable to reproduce. Professor Riley has also written largely on the subject, and he mentions another crop to which this larva has become terribly destructive. “ The glutton is not even satisfied with ravaging these two great staples of the country, cotton and corn, but, as I discovered in 1867, it voraciously attacks the tomato in South Illinois, eating into the green fruit and thereby causing much fruit to rot. In this manner it often causes serious loss to

the tomato-grower, and it may justly be considered the worst enemy to the tomato in that section of the country." Another writer says: "In Maryland in 1869 these worms did great injury to the tomato-crop, eating alike the ripe and the unripe fruit, gnawing great holes in them, and rendering them unfit for market use. One worm would sometimes entirely ruin a number of tomatoes on one plant." Other observers have found this voracious creature feeding on the "chick-pea" (*Cicer arictinum*), the young larvæ upon the leaves, the larger boring into the pods, the common scarlet-runner (*Phaseolus vulgaris*) and other leguminous plants, boring into the pods and eating out the contents. One further detail must not be omitted—Professor Comstock states that "on a plant, and undisturbed, large boll-worms have been seen to catch smaller ones, which they devoured, or simply pierced the skin with their mandibles so that the juice could be sucked, and the refuse dropped;" and that whenever these creatures were sent him from the South, although plenty of food was enclosed, "in case more than one boll-worm was mailed in the same box one only would reach us alive, all the others having been destroyed." And further, that in a state of nature this larva preys frequently upon the pupa of the cotton-worm (*Alctia argillacea*), forcing its way "into the leaves folded and pre-occupied by *Alctia*, the latter having already passed into the pupa state, for the express purpose of feeding on these pupæ. Many cases of this sort were seen." In some sense, therefore, this most effective destroyer seems to assume also the character of a protector of the crop!

PUPA stout, red-brown, anterior surface shining, mouth with a projecting ridge; front portion minutely granulated. wing and limb-covers finely sculptured with shallow incised lines; the anterior margin of the segments also sculptured with coarse punctures; cremaster very short and rounded, producing two long straight tapering spikes. In a smooth

earthen chamber, faintly lined with silk, beneath the surface of the ground, often to the depth of several inches. Apparently in this condition through the winter in this country; but in North America it is believed to hibernate in both pupa and imago-state.

The moth flies swiftly and eagerly in the daytime in hot sunshine and may then be seen, occasionally, hovering at the blossoms of clover, and hardly to be distinguished from the *Plusia gamma* buzzing around it, except that its colour is much lighter and browner. In dull or cool weather it hides among herbage, sitting with its head downward. At dusk it frequents ivy-bloom, or the flowers of *Aster tripolium*, *Centronthus ruber* and *Arbutus unedo*; I have taken it at sugar and it seems to be rather strongly attracted by a powerful light. Rare in these islands, indeed, possibly only occurring as an immigrant, since the larva appears never to be met with here, those described by Mr. Tugwell having been obtained from eggs laid by a captured female. The first British specimen seems to have been recorded from Salford, Lancashire, in 1840 by the late Mr. R. S. Edleston, and the second by the Rev. Murray A. Mathew, who found it in the year 1858 in Devon, flying in a field. More recently it has become rather frequent in that county, being taken almost every year on the coast near Torquay; and it has occurred in Cornwall, Dorset, Hants, Sussex, Kent—even so near to London as West Wickham; Surrey, Middlesex; once near Reading, Berks; Somerset, Gloucestershire, Herefordshire, Cambridgeshire, Suffolk, Norfolk, where, at Cromer lighthouse, no less than twenty specimens were obtained in 1875-6 by Mr. W. H. Thornthwaite; Cheshire, Lancashire, Yorkshire and Durham. In Wales I took a single specimen in a clover field near Pembroke, in one of those years in which *Colias Edusa* was common.

In Scotland it is recorded by the late Dr. Buchanan White in the Solway district; and in the past year (1898) the

capture of several specimens took place at Burnmouth, Eyemouth and elsewhere near Berwick-on-Tweed. In Ireland it has been found near Dublin and in Kerry.

Abroad it has an immense range, through Southern, Central and Western Europe, Southern Germany, Switzerland, and Livonia; Asia Minor, Armenia, India (whence a small variety has received the name of *succinea*), Japan, the Barbary States, Egypt, Aden, the Canaries, South Africa (where it abounds and varies exceedingly in size as well as colour); Australia, New Zealand, Java, Formosa; and as already expounded at some length, in multitudes in the Central and Southern portions of North America.

2. **H. peltigera**, *Schiff.*; **peltiger**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ inch. Fore wings light red-brown with a faintly darker transverse band; reniform stigma dark brown, extended to the costa; a round black dot at the anal angle. Hind wings smoky-brown, toward the base whitish.

Antennæ of the male simple, minutely ciliated, reddish-brown; palpi small, horizontal, moderately tufted, whitish-brown; eyes large, black-brown; head whitish-brown, the scales pressed down level and pointing forward; thorax smooth, pale reddish-brown or reddish-drab, the back portion paler and the scales only drawn together in the faintest manner; fascicles yellowish-white; abdomen very smooth, whitish-brown; lateral and anal tufts well developed, the latter reddish-drab. Fore wings rather pointed, costa very slightly arched throughout; apex sharply angulated; hind margin gently curved; dorsal margin straight; colour soft reddish-drab or pale reddish-brown, clouded with fawn colour; no basal line; first line faintly indicated, arising from a brown dot on the costa, and forming rather deep angles of the faintest possible redder shade; second line almost equally faint, formed of a series of deep crescents, their points of junction each marked by a minute white dot; subterminal line a curved pale shade which bounds, outwardly,

an oblique transverse stripe of brighter red-brown, becoming at the costa a dark brown blotch; orbicular stigma only indicated by a reddish-brown dot; reniform stigma large and distinct, leaden-brown edged with red-brown, except at the upper side, where it is apparently extended to the costa by a red-brown cloud, and forms the most noticeable marking upon the wing; but the most reliably *distinctive* marking is a round black dot which is placed just within the anal angle; cilia smooth pale fawn-colour, faintly dashed with brown. Hind wings rounded, smoky greyish-white to the middle, but with the nervures dark; the whole surface beyond the middle is occupied by a very broad smoky-black band, which also throws a shade up the dorsal margin; cilia white with a yellow-brown line along the basal portion. Female rather stouter, very similar.

Underside of the fore wings yellowish-white with a large black spot at the position of the reniform stigma, followed by a smoky-black transverse stripe, beyond which the hind marginal region is dappled with smoky-brown. Hind wings white with a more obscure smoky-black band along the hind margin, rather dappled at its edge with white; cilia whiter. Body and legs yellowish-white, the tibiæ pale brown.

Variable in the intensity of the ground colour of the fore wings from pale creamy-brown or buff to rich tawny and chestnut-red. Along with such extreme forms, in the collection of Mr. Sydney Webb, is one in which the blotch at the reniform stigma is the only noticeable marking. One in the cabinet of Mr. Charles Fenn has a large whitish blotch in the dark border of the hind wings.

On the wing in June and July, and as a partial second generation in August and September.

LARVA plump and full, very slightly narrowed toward the head, and still less so toward the hinder extremity; hairs short and bristly, single; head well rounded, green or yellow; body deep green with the dorsal and subdorsal stripes dis-

tinctly deeper green, and the spiracular line forming a still darker stripe, bordered below with white; the divisions of the segments also deeper green; spiracles and raised dots white; legs and prolegs green.

Or, green with broader dorsal and subdorsal stripes dull red, or rich bright purple-red, and short streaks of the same upon the spiracular stripe, which is edged below with yellowish-white.

Or, rich yellow clouded with pinkish-red, the dorsal and subdorsal stripes darker red, and the undersurface and legs green.

Or, reddish-brown, the stripes darker and dashed with black-brown, and the under portions green.

Or almost any other dorsal combination of green, grey-green, brownish-pink, light brown, purple, purple-grey and yellow. A wonderfully variable larva! Apparently in some degree affected in colour by that of the blossoms upon which it may chance to be feeding.

May or June to August, and a partial second generation in September and October; on restharrow (*Ononis arvensis* and *O. spinosa*), henbane (*Hyoscyamus niger*), *Pyrethrum inodorum* and *P. maritima*, *Arenaria rubra*, *Senecio*, *Salvia*, even *Ulex* (furze), *Calendula* (common garden marigold), *Erodium* (stork's-bill), and *Datura stramonium* (thorn-apple); feeding on leaves, blossoms, and seed-capsules.

PUPA slender, brown; in a slight cocoon in the earth. Not further described. A portion produce the moths in the same autumn, others lie through the winter, and some few through one or more succeeding winters.

The moth is, in this country, more particularly attached to the southern coast. It sits by day in fields, especially clover fields, or among herbage on sandhills, and is readily disturbed, flying for a short distance and settling again, and most likely flies voluntarily to flowers when the sun is hot, indeed there is a record of its capture when so attracted by

blooming heather. It has also been found, rarely, sitting on the sand. It flies more particularly at dusk, and then frequents blossoms of clover, *Silene inflata*, *Centranthus ruber*, and other plants, and will even come to sugar; but for some unexplained reason is rarely seen in the moth state, although in some seasons its larvæ have been found in considerable abundance. The late Mr. J. J. Reading recorded that in the years 1853-4, on the Cornish coast and that of Devon, hundreds, or even thousands, of the larvæ were to be found on *Ononis spinosa*, but there is no record that many moths were seen. Usually a rare species, but long known as an inhabitant of this country; indeed, Donovan recorded its capture by himself, in a lane near Tottenham, Middlesex, in 1793; and, as already stated, most frequent in Devon and Cornwall; but also recorded in the Scilly Isles, Dorset, Hants, Sussex, Kent, once each in Surrey, Herts, and Gloucestershire; also in Somerset, Herefordshire, and Worcestershire; several times in Cambridgeshire, Suffolk and Norfolk, and rarely in Cheshire, Lancashire, Yorkshire, and Durham. In Wales it has been taken near Neath and along the Glamorgan-shire coast; and at Pembroke my eldest son secured a single specimen flying about red valerian on a railway embankment.

In Scotland the only record that I can find is that by Dr. Chapman of a specimen taken in Ayrshire. In Ireland it has been met with near Cork and Wicklow. Like the last species, it has an immense range abroad; through Central, Southern, and Western Europe, Southern Germany, Hungary, Switzerland; Asia Minor, Armenia, Persia, with the Taurus Mountains, Kertch, the Himalayas; Madeira, the Canaries; the Barbary States—most abundant in Morocco—Egypt, South Africa, and New Zealand.

3. *H. dipsacea*, L.—Expanse $1\frac{1}{4}$ to $1\frac{3}{8}$ inch. Fore wings yellow-drab or reddish-drab, with olive clouding and a red-brown central band. Hind wings yellowish-white with a

large black central spot, and a broad black hind-border containing a white blotch.

Antennæ of the male simple, apparently naked, red-brown; palpi small, horizontal, whitish-brown, red-brown at the tips; eyes bright chestnut; head densely but rather smoothly tufted, brownish-drab; thorax smooth, olive-drab, the scales at the back long and rather curved in; fascicles smoky-white; abdomen yellowish-brown, thickly dusted with black; lateral tufts small, anal rather broad, all pale yellow. Fore wings somewhat trigonate; costa straight to near the tip, where it is a little rounded; apex bluntly angulated; hind margin nearly straight, hardly more curved toward the anal angle; dorsal margin straight or very faintly concave; colour olive-drab or reddish-drab; no basal line; first line scarcely perceptible as a faint angulated thread; at the middle of the wing is a broad brown transverse band the inner edge of which is sharply defined, the outer expanded in the dorsal area; second line almost imperceptible, but sometimes traceable in dots and curves; outside it is a second transverse brown band, sometimes incomplete, but the costal portion then visible as a brown triangle, its outer edge seems to form the subterminal line; hind margin faintly dotted with black; cilia olive-brown. Hind wings rounded, yellowish-white to the middle, except that the ordinary central spot is a large black blotch and extends as a stripe of the same colour along the costal margin to the base of the wing; beyond the middle is a broad dull black marginal band, near the middle of which is a large yellowish-white spot partly divided by a dark nervure, and near the anal angle another, much smaller; down the dorsal region is a smoky-black clouding covered by long whitish hair-scales; cilia yellowish-white. Female quite similar.

Underside of the fore wings creamy-white, with smoky clouding upon the margins; from the base is a straight black line, above it a round deep black spot; beyond this another, much larger, followed by a black transverse stripe shading

off toward both margins of the wing. Hind wings dusky white, with the whole pattern of the upper side obscurely visible except that the dark marginal band possesses another large excavated pale blotch. Body white; legs whitish-brown.

Not very variable, but examples from the New Forest district of Hants are rather smaller and darker in colour and also more strongly marked than those from the Eastern Counties. In the collection of Professor Meldola is one in which all the usually black markings of the hind wings are of a glossy light red; it was taken in Essex.

On the wing in June and July.

LARVA moderately stout, thickest at the middle segments, tapering a very little towards the head, and rather more towards the anal extremity, with a sudden slope down on the back from the middle of the twelfth segment, the thirteenth being rather elongated and the anal prolegs extended behind it; the head, which has rounded lobes, can be partially withdrawn into the second segment, its colour is green or pale pink, freckled with black or brown on the crown of each lobe; ground colour of the body varied, straw-colour, light drab, greenish-ochreous, full green, brilliant yellowish-green, rather glaucous-green, olive-green, rose-pink or deep purplish-brown; dorsal line a fine thread of the ground colour enclosed between two much darker lines, which commence on the third segment and thicken gradually as they approach the middle of the body, whence they, by degrees, narrow again; on either side of the back run two pairs of longitudinal, rather meandering lines, a little darker than the ground colour; the subdorsal stripe, of uniform width, is either white throughout, or white on the second segment and afterwards pale yellow, or becoming faintly tinged with the ground colour, or else greenish throughout; immediately beneath this conspicuous stripe is a broad longitudinal band of ground colour, greatly filled up with darker, its upper edge the

darkest; spiracular line whitish, pale green, or pale yellow; on it are placed the *circular* pale or white spiracles, outlined with black; beneath is a stripe of the ground colour or else ochreous or green, followed by a white line which passes in front of the anal prolegs; undersurface of the ground colour, with a darker, rather interrupted, band above the legs, which are of the ground colour or else greenish. The texture of the skin on all the darker portions is rough, being composed of extremely short and minute bristly blackish points, while in the intervals and on all the pale stripes it is smooth. (W. Buckler.)

July, August, and September; on the flowers and unripe seeds of wild carrot, thistle, toadflax, chicory, scabious, knapweed, purple clover, hawkweed, restharrow, *Crepis virens*, *Lychnis respertina*, and *Silene otites*; and in confinement even on the green legumes of the scarlet-runner bean (*Phaseolus*). Sometimes to be found on flowers in the daytime.

PUPA of moderate bulk, the head and palpi rather sharply produced; back of the thorax swollen; wing-covers broad at the ends; abdomen tapering and ending in two rather long anal points; abdominal segments roughened in the middle; colour pinkish-red-brown or dark brown. (W. Buckler.) In a weak thin silken cocoon in the earth. In this state through the winter, and sometimes continuing over another year, or more.

The moth is very lively in the daytime, in the hottest weather buzzing at the blossoms of clover, sainfoin, or bugloss, in cultivated fields, or at those of sea-holly and birds-foot trefoil on the coast sandhills. When the weather is less hot it prefers to sit on the ground in bare places in fields of clover, *Trifolium incarnatum*, *Anthyllis vulneraria*, and *Melilotus*, starting up in the most active manner when approached, flying round and settling upon another bare spot, to rise with equal or greater agility if followed. Indeed, its capture under these circumstances necessitates some careful

stalking. On heaths, which it sometimes frequents, its habits are similar. At night it flies again and pays another visit to the flowers.

A very local species, sometimes to be found in plenty in one or two fields, and hardly to be seen elsewhere for miles; also rather irregular in its appearances—perhaps from the habit of the pupa of often lying quiescent till a favourable season. Formerly said to be abundant on heaths near Farnham, Surrey; still in that county, but less common; also to be met with, in the uncertain manner already stated, in Kent, Sussex, Hants, Dorset, Cornwall, Somerset, Gloucestershire, Essex, and particularly in the district of the “Breck” sands of Cambridgeshire, Suffolk and Norfolk; in the latter county it has also been found on the coast sandhills near Yarmouth. Beyond this range it is very rare, but has been recorded from Sherwood Forest, Nottinghamshire, and in single examples from Yorkshire and Derbyshire. Apparently quite absent from Wales, Scotland, and Ireland. Abroad, however, it seems to extend over the whole of the Continent of Europe except the extreme north, Northern Africa, and a large portion of Asia, including India.

4. **H. scutosa**, *Schiff.*—Expanse $1\frac{1}{4}$ inch. Fore wings white, clouded and banded with smoky-brown; the *three* stigmata large, black-brown. Hind wings white with a large black central spot and a divided black hind band.

Antennæ of the male simple, very minutely ciliated, blackish-brown; palpi small and short, of the same colour, but tufted with dusky-white hair-scales; eyes brown; head rather smooth, olive-brown; thorax similarly coloured, not very stout; fascicles dusky-white; abdomen dark brown, thinly dusted with hoary scales; lateral and anal tufts golden-brown.

Fore wings somewhat trigonate; costa very faintly arched throughout; apex bluntly angulated; hind margin oblique and gently curved, but the anal angle distinct; dorsal margin

rather gracefully curved ; ground colour white faintly clouded with brown, but very much obscured by dark markings of an olive-brown or black-brown colour, the nervures especially white ; basal line indicated by two black dots, or short streaks, edged with white ; first line most visible in its middle portion, where it is oblique, black, and rather thick, its remainder dark brown ; second line a somewhat obscure series of black-brown dashes between nervures, but broken outside the reniform stigma ; subterminal line only visible as the interval between an olive-brown oblique transverse band divided by white nervures, and a creamy-white irregular stripe close to the hind margin, which last is edged narrowly with olive-brown ; orbicular stigma large, olive-brown, edged with black, joined to a similar large spot below the median nervure which appears to be the claviform stigma ; reniform of the same colour, large and conspicuous ; costal margin clouded with olive-brown ; cilia white shot with brown and margined inwardly by two rows of black streaks enclosing white dots. Hind wings hollowed beneath the apex ; creamy-white, clouded at the base, on the dorsal margin, and on the nervures, with brown ; central spot large and conspicuous, dull black ; across the middle of the wing is a slender irregular olive-brown line, immediately followed by a very broad smoky-black band which occupies the hinder half of the wing but contains three or four creamy-white spots ; cilia white, spotted with black-brown. Female quite similar.

Underside of all the wings shining creamy-white ; fore wings with two large black spots before the middle, and a larger one beyond it, followed by a clouded black band ; hind marginal region streaked and clouded with smoky-black. Hind wings as on the upper side but the markings not so dark, the pale spots in the marginal band larger and coalescing. Body and leg-tufts white ; legs brown.

Rather variable in the size of the dark spots and bands.

On the wing in July and August. Abroad it is said to

appear also in May and June in an additional and earlier generation.

LARVA. Dorsal region dark grey-green, almost blackish ; lateral and undersurfaces yellow ; on the back lie on each side three interrupted yellow longitudinal lines, of which the two middle ones are the darkest ; raised dots black and distinct ; spiracles black ringed with white ; on the sides of the second and third segments are placed, in the situation of the spiracles, two black tenon-shaped raised dots, over the feet is a dark-margined paler irregular longitudinal stripe ; prolegs black. Head yellow, dusted with black and with a black spot on each side of the lower portion ; dorsal shield black, with three yellow longitudinal lines. (Hofmann.)

June and July, and sometimes in a second generation in August and September, on *Artemisia campestris* and other species of wormwood ; occasionally upon *Chenopodium*.

PUPA red-brown with the wing-covers greenish. Not more fully described. In a slight silken cocoon, in or upon the earth.

The moth is said to fly by day as well as at night, and to frequent the blossoms of thyme. Doubtless it is attracted, like its allies, by any suitable honey-producing flowers. It is, however, so exceedingly rare in this country that we have little or no practical knowledge of its habits. The first recorded British specimen was that figured by Curtis and Wood, and taken "on the banks of the River Caldew, near the village of Dalston in Cumberland, in July 1835," by Mr. James Cooper, of Carlisle. The next capture appears to have been of three specimens near Skinburness, on the shore of the Solway Firth, by Mr. R. R. Rothwell, then a boy at school, at about the same date. One of these examples came into the possession of the late Rev. H. Burney ; another is, I believe, in the collection of the late Mr. J. Sidebotham, and still treasured by his son, Mr. J. W. Sidebotham, M.P. The third

is said to have been destroyed. In 1875 and 1876 two specimens were secured at a lighthouse at Cromer, Norfolk, by Mr. R. Cumber, son of the lightkeeper, and sent unset and unknown, with numerous other species, to Mr. W. H. Thornthwaite, for whom the captor was collecting such insects as came to the light. One of these Mr. Thornthwaite most liberally placed in my collection. In the following year another was recorded, taken flying at dusk over clover at Weston-super-Mare; and a year later Mr. W. H. Campbell had the good fortune to secure one on August 19, flying in the sunshine, at 3.30 P.M., over rough heathery boggy land on a hillside near Buncrana, on the shores of Lough Swilly, in the north of Ireland. In the collection of Dr. P. B. Mason, at Burton-on-Trent, is a specimen labelled, "Captured by A. Coburn, flying in the sunshine, 24th June, 1880, near Attleborough." This is, therefore, a third Norfolk example. In 1891 Mr. W. Reid, of Pitcaple, recorded the capture, in July 1878, of a specimen at Bay of Nigg, near Aberdeen, flying in bright sunshine over rough ground and stones. This seems to complete our record, which therefore includes Somerset, Norfolk, and Cumberland in England, Aberdeen in Scotland, and Donegal, Ireland. Abroad the insect is common throughout Central Europe, Southern France, Northern Italy, Livonia, Northern Turkey, Southern Russia, Morocco and other parts of Northern Africa, India, China, and the mountainous regions of Central Asia.

Genus 89. **HELIODES.**

Antennæ naked, dark brown; palpi very small and blunt, quite inconspicuous, whitish-brown; eyes naked and without lashes; thorax small, almost round, shaggy, crested at the back; abdomen short and small, without crests; fore wings broad, short, and very blunt; hind wings small, brightly coloured, cross-bar long, angulated, very

slender; vein 5 arising below the middle. Among our smallest *Noctuae*.

We have but one species.

1. **H. arbuti**, *Fab.*; **tenebrata**, *Staud. Cat.*—Expanse $\frac{5}{8}$ inch. Fore wings broad and very short; red-brown shaded with black-brown or black in obscure bands. Hind wings bright yellow with the base, and a broad hind-marginal band, black.

Antennæ of the male short, simple, naked, black-brown, barred at the back with white; palpi very short, horizontal, bluntly tufted, purple-brown; eyes shining black; head tufted, purplish-brown; thorax small and rounded, collar and shoulder-lappets raised, all purple-brown; abdomen very small, blackish-brown, dusted with yellowish scales; lateral tufts hardly perceptible; anal tuft small. Fore wings small, short but rather broad and very blunt; costa faintly arched; apex bluntly angulated; hind margin gently curved, not very oblique; dorsal margin straight; colour velvety chocolate-brown, faintly dusted with ashy-white; first and second lines imperceptible, except under a lens, which merely shows them chocolate-brown *without* ashy scales; between them is a central shade or band of chocolate-black, velvety and forming three faint loops; before and beyond it are scattered most of the ashy-white scales; subterminal line distinct at the costa, sharply edging a chocolate space, and dividing it from an apical and marginal space which is much dotted with bluish-white scales, and extends one-half the distance to the anal angle, beyond this the line almost disappears; stigmata not indicated; costa beyond the middle spotted with pale yellow, the largest spot extending round the apex; cilia pale chocolate at the apex of the wing, the middle of the hind margin, and the anal angle, the intermediate spaces being creamy-white with an intersecting brown line. Hind wings rounded, black at the base, and having a broad black band round the hind margin; the middle area of the wing being rich orange-yellow; there is also a faint superficial

dusting of orange-red upon the black band ; cilia yellowish-white. Female extremely similar.

Underside of the fore wings smoky-black, broadly dusted along the costal and hind-marginal regions with pale yellow, along the dorsal margin greenish-white ; just beyond the middle is a large orange-yellow blotch. Hind wings orange-yellow, abundantly dusted with black, and having the marginal black band obscurely reproduced in black dusting. Body and legs pale grey-brown dusted with black ; tibiae barred with black.

Hardly ever variable, but in the cabinet of Mr. S. Stevens is a specimen in which the yellow hind wings are much suffused with black.

On the wing in May and the beginning of June.

LARVA when full grown about $\frac{3}{4}$ inch long, moderately stout and of true *Noctua* form ; with the twelfth segment plump ; thoracic segments slightly tapering toward the small and rather flattened head, which with the dorsal plate is of a glossy pale green ; colour of the body light green ; dorsal line dark green ; subdorsal line whitish, finely edged above with dark green ; spiracular stripe yellowish-white or pale yellow, well relieved along the upper margin by a conspicuous dark green stripe ; spiracles white, faintly outlined with black ; raised dots brown, but almost imperceptible ; undersurface and legs rather paler green than the back ; the skin soft and smooth. When about to spin up all the lines disappear and it becomes of a uniform green tint.

When newly from the egg it is white with a brown head and a narrow brown dorsal plate. At a fortnight old the head is brown, spotted and streaked with darker brown, and the body either pale watery-green, or else tinged with pinkish-grey, with a dark green dorsal line, a whitish subdorsal, and a broader white spiracular line, the prolegs clear and nearly colourless. After the next moult the head and second segment are pale brown with slightly darker brown markings,

the body much more richly and deeply coloured than before, greenish-grey or pinkish-grey ; dorsal line slate-green, in the middle of a broad softened stripe of paler ground colour ; the subdorsal line and spiracular stripe conspicuously white. After another moult the adult colour is assumed. (Adapted from Buckler.)

June and July on *Cerastium valyatum*, *C. arvense*, *C. triviale* and *C. glomeratum* ; feeding for the first fortnight inside the green capsule upon the unripe seeds, afterwards exposed, but still upon the seeds and flowers.

PUPA short and thick with a bluntly tapering abdomen having at the tip two fine thorny points of great minuteness ; colour shining reddish-brown. In a rather solid cocoon of earth kneaded well together with silk, of close texture and not very brittle, at the depth of an inch or two beneath the surface of the ground. (W. Buckler.)

The moth flies in the sunshine in meadows and sheltered fields, often being found only in the more sheltered sunny corners ; here it buzzes and flits about, settling often on the blossoms of the common daisy, or dandelion, or any other flower that may be in bloom, including of course the mouse-ear chickweeds. So far as is known it does not move at night nor in very dull weather. Though rather local it is common in suitable spots in most parts of the Southern, Eastern, and Western Counties ; less so in the Midlands, but extending to Lancashire, Yorkshire, and even Durham, where it is rare. There is a single record, not contradicted, in Scotland—near Glasgow. Probably it would be found if looked for in many parts of Wales, but records are very few. There is one such in North Wales ; and I found it quite commonly in two small fields in almost the extreme corner of Pembrokeshire, near the little fishing village of Angle. In Ireland it seems only to have been noticed in the counties of Kerry and Sligo. Its range abroad is tolerably wide, the whole of Central and Northern Europe except the most frigid

portions ; Northern Italy, Sicily and the mountains of Greece ; Northern Turkey, Southern Russia. and the Central Asian mountain districts.

Genus 90. **ACONTIA.**

Antennæ ciliated ; eyes naked, without lashes ; thorax only moderately stout, crested at the back ; abdomen more slender, not very short, not crested ; fore wings rather broad, of moderate length, very blunt, brightly coloured ; hind wings also usually brightly coloured, very broad, the cross-bar long and angulated, and vein 5 from below the middle.

We have three species, widely different from each other.

A. Hind wings white with a broad black border.

B. Fore wings white, very broadly banded from the middle with black-brown, but with a large white spot on costa and at anal angle. *A. solaris.*

B². Fore wings black-brown with a large white costal blotch. *A. luctuosa.*

A². Hind wings greyish-white, shining.

B³. Fore wings pinkish-white with olive-brown or pale chestnut blotches. *A. venustula.*

1. **A. luctuosa**, *Esp.*—Expanse 1 inch. Fore wings short and broad, black-brown rather marbled with grey and white ; a costal white blotch beyond the middle extends more than halfway across the wing. Hind wings black with a broad central white band, and white clouds in the hind margin.

Antennæ of the male short, simple, most minutely ciliated, brown-black ; palpi of the same colour, short, slender, and pointed, and having a small fringe of whitish scales along the lower edge ; eyes glossy black-brown spotted with deep black ; head unusually smooth, smoky-black ; thorax similar, narrow, the scales large and tipped with a purple lustre ; back crest depressed but divided into two tufts which are tipped with chocolate ; fascicles smoky-grey ; abdomen slender, dark smoky-brown dusted with white ; lateral tufts small, dusky-

white; anal tuft long, light brown. Fore wings broad, almost truncate; costa nearly straight, faintly more rounded near the apex, which is bluntly angulated; hind margin a little rounded but almost perpendicular; dorsal margin straight; colour black-brown; basal and first lines velvety-black, each forming a series of short curves, the latter very perpendicular; second line very slender, black, forming two strong curves above the dorsal margin, then bent out and passing obscurely to the costa; touching it and occupying the previous costal space is a large white or pinkish-white blotch extending halfway across the wing and including part of the usual situation of the reniform stigma, of which there is no indication except that a previous upright black streak in the discal cell possibly represents its anterior margin; orbicular stigma a small black ring; subterminal line formed by a row of deep black dots parallel with the hind margin, but preceded by an incomplete series of irregular deep black wedges and angles about which is a considerable dusting of white; at the costa before the apex is a larger black spot with bluish reflections and broken up by white costal dots; at the anal angle is a white blotch containing brown spots; extreme hind margin shaded with golden-brown; cilia white with a broad brown blotch in the middle portion. Hind wings rounded, smoky-black with a broad creamy-white transverse band in the middle, and a dusted white spot near the hind margin; cilia white interrupted in the middle space with black. Female closely similar.

Underside of the fore wings black clouded with white on the margins; the large white spot beyond the middle reproduced but more oval; anal angle white; and white spots lie before the apex and in the cilia. Hind wings as on the upper side but with rather more white clouding along the hind margin. Body and leg-tufts dusky white; tibiae black, barred with white.

On the wing from the end of May to the beginning of July, and as a second generation in August.

LARVA when full grown about an inch and a quarter in length, slender, stoutest in the middle, tapering a little in front and more toward the hinder extremity; the folds and divisions of the segments moderately indicated on the first four or five, but hardly noticeable upon the remainder; the first and second pairs of prolegs less developed than the rest. Head rather smaller than the second segment, slightly hairy, very pale grey, having on each side four lines of black dots in continuation of the dark stripes on the body; dorsal plate dull dark brown, through it run conspicuously the dorsal and subdorsal pale stripes; ground colour on the middle of the back pale greyish-ochreous, brownish-grey, or reddish-grey, the sides darker and browner; the dorsal stripe tapers at each extremity of the larva, but is narrowest in front, and of the pale greyish-ochreous already described, faintly outlined interruptedly by short lines or dots of black, and sometimes by freckles of a deeper ochreous-grey tint; while in some examples two short black streaks appear at the beginning of each segment almost forming a **V** pointing forwards; a kind of dorsal chain-pattern is formed by a rather broad sinuous stripe of dark grey-brown, below which the subdorsal stripes, a little paler than the ground colour, are edged with a line of dark brown; beneath this are placed three other dark brown lines, the lowest of which is the spiracular, and is broader than the other two, which last are slightly sinuous, the second bearing a pale dot at the beginning of each segment, and touching the spiracular stripe in the middle of the segment; spiracles circular, black; beneath them is a broad stripe of very pale brownish-grey edged above with a paler thread and below with a rather darker stripe of reddish or greyish-brown, followed by a paler one above the legs; undersurface rather deeper greyish-brown, with a central brown stripe bearing upon the middle of each segment, beyond the fourth a round blackish spot; legs pale brownish-grey; prolegs similar, with a dark brown dot on the outside. When young it appears to be a veritable looper, twelve legs only being

visible, but as it grows larger the other two pairs of ventral legs become visible, though the first pair is not used. (Adapted from Buckler.)

End of May and June, and in a second generation in September, upon *Convolvulus arvensis*, eating the leaves, flowers, and seeds, feeding at night and reposing during the day upon the stems close to the ground, lying along and closely clasping the stems.

PUPA red-brown, in the earth. Not more particularly described.

The moth flies in the sunshine in fields of clover, lucerne, sainfoin, and *Trifolium incarnatum*, in meadows, fields, and on chalk hillsides, buzzing at the flowers of these plants, and at those of wild thyme and other *Labiates*, but in dull weather it seems to be quiescent during the day. At late dusk it also frequents flowers, but is difficult to see in flight, though it is gentle and not swift in its movements, and may be taken with the help of a lantern. Very rarely it has been observed at light. Extremely local and very uncertain in its appearances; formerly plentiful in Surrey, Sussex, and Kent, and has even been taken at Lewisham in the London suburbs, now scarcer and much more local in these counties; more frequent in the Isle of Wight, Dorset, and the south coast of Devon; much more rare in Somerset and Gloucestershire, but found locally in Wilts, Berks, Oxfordshire, Cambridgeshire, and Essex, and in more considerable numbers in the Breck-sand district of Suffolk and Norfolk. This, however, seems to be the extent of its range in these islands. Abroad it is common throughout Central and Southern Europe, Livonia, Bithynia, and other parts of Asia Minor; Morocco and other portions of Northern Africa, and in the mountainous regions of Central Asia.

2. **A. solaris**, *Esp.*; **lucida**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{1}{4}$ inch. Basal region of fore wings broadly white, beyond

olive-brown, with a squared white blotch toward the apex and a white cloud at the anal angle. Hind wings white with a broad black marginal band.

Antennæ of the male nearly naked, simple, whitish-brown; palpi, head, and thorax pure white, the latter stouter than in the last species and having the scales at the back slightly raised into a flattened shelf-like crest; abdomen silvery-white with a dull smoky-brown anal tuft. Fore wings rather trigonate, not very broad; costa very gently arched; apex smoothly rounded; hind margin also very smoothly rounded but not very oblique; dorsal margin nearly straight; basal portion of the wing pure white to near the middle and throwing out a projecting angle into the next portion, which is a broad central band of a leaden-brown; on the median nervure close to the base is a minute black dot, and beyond it from the costa a faint brown cloudy dash; no other traces of the basal or first line; second line, when visible, a deep black series of small crescents and dots, which bounds the central dark band, but is abruptly terminated by a large quadrate white blotch upon the costa; immediately outside the second line is a faint series of whitish clouds, closely followed by a second broad dark band, which is of a rather paler leaden-brown, and is produced to the anal angle, but above this is bounded by a rippled and curved white sub-terminal line; outside the lower half of this band the hind marginal region is occupied by a large ovate white blotch in which is a row of leaden-brown cloudy spots; outside the upper portion a more chocolate-brown blotch reaches the apex and hind margin, and contains a partial row of white dots; these two portions of the margin extend their dark or white colouring respectively to the cilia; the reniform stigma is most obscurely indicated by two whitish rings placed perpendicularly. Hind wings shining pure white, with a broad, rather sinuous, smoky-black band along the hind margin, but not reaching the anal angle; outside this band the extreme margin and the cilia are pure white, the former a little dashed

towards the apex with dark colour from the band. Female quite similar.

Underside a fainter copy of the upper, but with a black spot on the costal margin of the hind wings. Body and legs white.

There is a well-recognised recurrent variety, known as *A. lucida*, in which considerable bluish-brown clouding in the white basal area of the fore wings seems to suggest cloudy basal and first lines; in this the ovate white blotch at the anal angle is also rather obscured, and smoky-black streaks or shades run from the base of the hind wings, in the female darkening them considerably.

On the wing in May, June, and August, in two generations.

LARVA thick but rather attenuated in front, naked, having only twelve feet, the eleventh segment rather raised; head small, red-brown edged with yellow; body red-brown throughout with delicate dull yellow flecks and rippling lines; dorsal plate angular, shining, of the body colour; dorsal and side lines only very faintly indicated; raised dots small, dark brown with their bases yellowish; anal plate yellowish dotted with black; spiracular lines very slender, waved, consisting of the most minute yellow dots; spiracles white edged with black; on the back of the fourth to the sixth segments inclusive is a dark red-brown blotch edged by an oblique yellowish line, and on the eighth and ninth a fine yellowish line from the spiracular line downwards to beneath the pro-legs, which are of the colour of the body.

June, July, and September, in two generations, upon *Convolvulus arvensis* and *Malva rotundifolia*, in dry places. (Hofmann.)

PUPA apparently undescribed, in the earth.

From its extreme rarity scarcely anything is known in this country of the habits of this moth; but it is on record that

a specimen was taken in a clover field near Brighton, flying in the sunshine, by the Rev. Percy Andrews, on the 25th of August, 1859. This specimen I have seen, carefully labelled, in the collection of the late Rev. H. Burney. Stephens in his "Illustrations" states that two specimens were taken in the metropolitan district and four more near Dover early in the century. He intimates that the captors were unaware of their rarity, saying that the specimens were "rescued from oblivion by the late Mr. Stone." Mr. C. W. Dale confirms the capture of four at Dover, saying that one of them was actually captured by Mr. Stone in June 1825. One of these is, I believe, in the collection of the late Mr. F. Bond, in Mr. Sydney Webb's possession; apparently two others came into the possession of the late Mr. Edwin Shepherd, and are now in the collection of Dr. P. B. Mason at Burton-on-Trent, with three more reputed British examples from the cabinet of the late Mr. Edwin Brown. The above is all the evidence that I can find for this insect as a British species. Abroad it is widely distributed through Central and Southern Europe, Northern Africa, Madeira, the Canaries, Armenia, Asia Minor, India, and the mountainous regions of Central Asia.

3. **A. venustula**, *Hüb.*—Expanse $\frac{3}{4}$ inch. Body slender, fore wings shining rosy-white, with a large tawny blotch, capped with black, arising from the dorsal margin, and a similar cloud along the hind margin. Hind wings shining greyish-white.

Antennæ of the male short, simple, minutely ciliated, light brown; palpi short, pointed, curved up, narrowly tufted, chocolate-brown; eyes large and prominent, black; head rather smooth, purplish-brown; collar dull brown edged with white; thorax very small and slender, pink, with a small crest tipped with chocolate; fascicles small, white; abdomen very slender, shining pinkish-brown with a well-developed light brown anal tuft. Fore wings rather ovate; costa

arched; apex and hind margin rounded; dorsal margin also a little filled out; texture very silky and delicate; pale pink clouded with pale olive-brown and pale chestnut; first and second lines undulating, white, not sharply defined, but the latter is joined in the middle to another white line which accompanies it to the costa, and also throws off above the middle a broad white cloudy streak to the apex of the wing; from this last, just below the tip, a faint interrupted white subterminal line passes to the anal angle, where it spreads into a small whiter blotch; before the first line arises an olive-brown or pale tawny dorsal blotch which attains the second line, and at its highest point, which is more than half-way across the wing, is capped by a black elongated spot; this is edged outwardly by a curve of the white line which branches from the second; where these two divide is a cluster of black dots, and another cluster lies at the inner edge of the dorsal blotch; costa mainly shaded with pale olive-brown; hind marginal region broadly with pale olive-tawny or purplish-chestnut forming a large ovate blotch, the extreme margin shaded with fulvous; cilia purplish-brown. Hind wings silky dusky white, the nervures faintly brown and the hind margin tinged with smoky-grey; cilia white shaded with brown. Female similar.

Underside of the fore wings dusky white dusted all over with smoky-brown. Hind wings white rather dusted with brown, and the nervures broadly indicated in the same. Body and legs light pinkish-brown.

Very constant in colour and markings, variation being shown only in the whiteness or pink shading of the ground colour.

On the wing at the end of May and in June.

LARVA having sixteen feet, the fourth, fifth, and sixth segments much enlarged beyond the rest of the body, and the twelfth slightly humped; the colour generally is a rich warm brown, with a row of eight dusky-red diamonds down the back

enclosing the dorsal line of brighter red ; on the fifth segment are two irregularly-shaped lateral spots, either white or reddish-orange, and on the sixth two smaller spots, black ; the subdorsal line is blackish and very faint, except on the eleventh and twelfth segments ; ventral surface dusky-grey. (Rev. J. Hellins.)

July and August on the blossoms of *Tormentilla reptans* and *T. officinalis*, and occasionally upon those of bramble and *Potentilla anserina*.

PUPA undescribed, except that it is small and red-brown ; in a cocoon in the earth.

The moth hides in the daytime in masses of tangled fern and bramble, or among heather, and in warm and very favourable weather may occasionally be disturbed and induced to fly a short distance in the daytime, but quickly darts down and hides itself close to the earth. It flies freely for a short time at early dusk, or even at sunset on a very calm evening, but is hardly to be seen at any time on the wing if the weather is in the least wet or chilly. Its flight is only for short distances over the heather, or along glades or paths in woods, and it quickly settles, to fly again a short distance, but if struck at with the net and missed darts down at once to the ground. It does not seem to be attracted by flowers or any of the usual means of obtaining *Noctua*. Excessively local in this country, and confined to large woods or heathery forests. The first known specimens with us appear to have been two captured in 1792 in Epping Forest, Essex, by the late Mr. James Francis Stephens, author of the "Illustrations." In that work he mentions two more, taken about the same date in the same place. No further examples seem to have been noticed for over fifty years, but in June 1845 the late Mr. H. Doubleday, when walking through a heathy part of Epping Forest, observed several specimens flying over, and alighting upon, the common fern. Returning the next day fully prepared for collecting a series, he was unable to

find a single specimen. A number of years again passed, but in 1859 a good many were seen, and some captured, in the same locality, and in 1860 it was found in some abundance; since then it has been found to inhabit several tracts of the same Forest, and few years have passed without captures. In 1874 it was discovered in plenty in St. Leonard's Forest, near Horsham, Sussex, where it has often since been found, by Mr. W. C. Boyd and others, in greater plenty than in the old Essex locality, so that most good collections are now furnished with a series. These two are the only counties in which it is known to me to occur in these islands. Abroad it has a considerable range through Central Europe, the Balkan States, Southern Russia, Armenia, and the mountainous regions of Central Asia.

(*A. catena*, *Sowerby*.—As figured by Curtis this species is about the size of *A. solaris*, its fore wings creamy white with faint grey shades, a loop-like streak from the costa near the base, a broad crescent-like streak in the middle of the costa, a row of black rings in a white stripe along the hind margin preceded by a blue-black stripe edged with pale yellow, and the cilia light brown; hind wings pinkish-white with brown nervures—a curious creature, more like a design for an imaginary insect than an actual species. His description does not quite agree: “Pale cream colour, shining; antennæ ochreous; eyes brown; superior wings sublanceolate with a brown and grey spot at the base upon the costa, margined with yellow, and having three pale lines across; a triangular one of the same colour at the middle of the costa; the posterior margin with a lilac-coloured fimbria, the internal edge yellow; close to the base of the cilia, which are yellowish-lilac, is a line of white spots with lilac centres forming a chain, and decreasing in size to the apical one, which is oblong, that at the posterior angle being the largest, bearing a dark purple spot with a lilac centre, and a semicircular ochreous line on the outside. Inferior wings pearly white, a

small portion of the margin slightly tinged with yellowish-brown." A single specimen was said to have been taken at Brixton, London, about the middle of September, 1793.

This insect was subsequently recognised as a North American species, brought to this country either accidentally or otherwise; and it would have been unnecessary to notice it here but for the curious circumstance of the capture of another specimen some years ago. In the year 1885 the Rev. C. F. Thornehill wrote to *The Entomologist* that he had seen, in 1878, in the collection of an engine-driver at Nottingham, a remarkable *Nortua* which he was then quite unable to identify. He says, "I had almost forgotten the circumstance when one day turning over casually the first volume of 'Humphrey and Westwood' I came upon the figure of a moth (Plate 54, Fig. 1) which I at once recognised as the identical insect. This was named *Euphasia catena*. The collector in whose boxes I saw it informed me that he had himself taken it in a lane near Nottingham; and from the little store he seemed to set by it, I feel confident that this is a true account of the matter." There can be no reason to believe it to be more than accidentally introduced into these islands.)

Genus 91. **HYDRELIA.**

Antennæ ciliated; eyes naked, without lashes; thorax slender, smooth, very flatly crested at the back; abdomen slender, not crested; fore wings oblong, much squared, brightly coloured and with abnormal markings; hind wings plain, the cross-bar long, and the cell which it crosses very broad; vein 5 very slender, attached below the middle.

LARVÆ slender, smooth, with the first and second pairs of prolegs either aborted or incomplete.

We have but two species—very different.

A. Fore wings shining olive-chestnut, with two transverse silvery white stripes. *H. argentula*.

A². Fore wings rich olive brown ; a broad pale stripe along the costa projects a finger into the middle area. *H. uncanæ*.

1. **H. argentula**, *Hüb.*; **Bankiana**, *Fab.*—Expanse $\frac{7}{8}$ to 1 inch. Body slender ; fore wings soft olive-chestnut or orange-brown, with two irregular, oblique, clear white transverse stripes, and the hind margin streaked with white. Hind wings brownish-white.

Antennæ of the male slender, simple, minutely ciliated, pale brown, faintly barred at the base with white ; palpi short and small, narrowly tufted, yellow-brown ; eyes reticulated, black ; head small, rather flatly scaled, whitish-brown ; thorax small and narrow, smooth, pale olive-brown, collar edged at the back with white ; shoulder-lappets splashed with the same, the scales at the back gathered into a small ridge-like white tuft tipped with frosted black ; fascicles short, white ; abdomen very slender, small, pale brown dusted with white, lateral tufts rather spreading, anal tuft narrow, pale brown. Fore wings short and broad, of thin texture ; costa arched, especially so at the base ; apex bluntly angulated ; hind margin faintly curved and hardly oblique, leaving the anal angle distinct ; dorsal margin straight ; colour olive-chestnut or pale orange-brown, very soft and shining ; before the middle is a conspicuous white transverse stripe, edged slenderly on each side with black, placed obliquely outwards from the costa and produced inwards along that margin to the base ; half-way down it is a small outward projection occupying the usual position of a claviform stigma ; beyond the middle is a second, equally conspicuous, white transverse stripe almost parallel with the first, edged with black dots, expanded on its inner edge above the middle so as to indicate the place of the reniform stigma ; along the hind margin is a straight white stripe, clouded with olive-yellow and dotted with olive-black, which includes the cilia ; before the apex is

a slender white oblique streak. Hind wings rounded, dusky white, much dusted and clouded with pale smoky-brown, especially on the dorsal region and along the hind margin; cilia white, intersected by a brown line. Female similar, with the body a very little stouter.

Underside of the fore wings smoky-brown with a white dash in the discal cell; cilia dusky white. Hind wings white, dusted with large brown scales, and with a faintly brown hind-marginal band; cilia white, dusted with brown. Body and legs pale brown, dusted with white.

Hardly variable except that the ground-colour of specimens from Ireland seems to be of a yellower-brown tinge.

On the wing in June.

LARVA with four pairs of prolegs, the pair upon the eighth segment small and undeveloped; strikingly slender, especially so as it attains its full growth of one inch; head round, light green with the upper lip whitish and the mouth black; body yellow-green with yellow segmental folds; dorsal line dark green though faint; subdorsal stripe primrose-yellow; spiracles flesh-coloured and rather round, placed upon a deep yellow, thread-like trachæa which shows faintly through the skin.

When just hatched the young larva is of a pale yellowish-green with very fine black dots and hairs, and at this time the second pair of prolegs is ill developed and the first absent; at the end of a week the skin has become less clear and the colour uniform light yellowish-green, with black raised dots. In another fortnight it becomes longer and in proportion more slender, of a more opaque velvety-green with the lines beginning to show themselves. From this the adult colouring is soon assumed. (Adapted from Buckler.)

End of June to the beginning of August, on grasses—*Poa annua*, *P. aquatica*, *P. pratensis* and other species, especially those growing in marshy places. When at rest lying stretched along the stem of the grass. When very young it eats only the lower surface and parenchyma of the

grass leaf. When full grown it may sometimes be obtained by shaking the stems of the taller grasses in its favourite haunts.

PUPA short and stout, the wing-covers well defined and rather long, the thorax full; abdomen tapering obtusely to the tip, which is furnished with two fine points and some minute curly-topped bristles; colour light drab, but in the spring it becomes of a dark brownish-green and is rather shining. In a cocoon just beneath the crown of grass-roots almost close to the surface of the earth. The winter is passed in this state. (W. Buckler.)

The moth sits during the day among marsh grasses, sweet gale and other herbage, and is readily disturbed in the afternoon, flying rather heavily to a short distance and then settling down again. At sunset or early dusk it flies voluntarily, but so far as I know has not been found to move about at night. It is one of our most strictly local species, confined to fens and bogs, but even in them to especially favoured spots only. It appears to have been noticed in this country as early as 1775, and Fabricius described it (under the name of *Pyralis Bankiana*) from British specimens. Mr. Haworth, however, at the beginning of the present century knew it only as represented in the cabinet of Mr. Swainson. Later he was more fortunate, for Stephens says (Illust. 3, 118): "Mr. Haworth found a considerable number of specimens in Norfolk, I believe near Beachamwell, amongst reeds and rushes in a boggy situation, and kindly supplied me with specimens." It is said also to have occurred at Whittlesea Mere before that rich collecting ground was destroyed. Whether the Norfolk locality was correct or not seems now doubtful, but no further occurrence of this species there is on record, and it had become, as supposed, a lost species to these islands when, somewhere about the year 1858, a visit was paid to Killarney, in the extreme south-west of Ireland, by Messrs. E. Birchall, A. A. Dunlop, and N. Cooke. One

of the most interesting results of their journey was the finding of this pretty species in abundance among the sweet gale and other herbage on the bogs about Tore cascade, Mucross, and Dinas Island; the wettest bogs appearing to be the most to its taste. In 1877 two specimens were taken at Wicken Fen, Cambridge, by Mr. A. B. Farn, and the next year two more by Mr. W. H. B. Fletcher, but it was not till 1882 that the metropolis of the insect in that county was discovered a few miles from Wicken Fen, at Chippenham Fen, by Mr. W. Warren. Here it is taken every year by those who have permission to collect in the fen. It may also be still found in varying numbers in the Killarney district by those who undertake the journey, and has been observed in other places in Kerry, but I know of no other localities for it in the United Kingdom. Abroad it has a wide distribution, through Central Europe, Northern Italy, Livonia, Northern and Eastern Turkey, Southern Russia, Armenia, Persia, Tartary, China, and the Altai mountain districts.

2. **H. uncana**, *L.*; **unca**, *Schiff.*; **uncula**, *Staud. Cat.*
—Expanse 1 inch. Body slender; fore wings olive-brown; costa broadly dusky white, with a white finger projecting into the middle of the wing; hind margin striped with white. Hind wings pale smoky-brown.

Antennæ of the male simple but the joints visible, minutely ciliated, light brown; palpi small and slender but rather pushed forward and curled up, blackish-brown; eyes deep velvety-black; head rather flatly tufted, black-brown; thorax smooth, except a small flattened knob-like tuft at the back, dull pale brown dusted with purplish-brown; fascicles short but distinct, yellowish-white; abdomen slender, dull brown dusted with black; lateral tufts small, anal tuft rather long. Fore wings somewhat oblong, costa distinctly arched; apex very bluntly angulated; hind margin hardly oblique, very full but rounded off below the middle; dorsal margin

straight; ground colour olive-brown, palest toward the dorsal margin; along the costa is a very broad stripe, dusky-brown along the costal edge, shading inwards to yellowish-olive and to white along its inner edge, having a small swollen projection near the base and in the middle throwing off a broad finger-like white mark into the middle of the wing; beyond this the deep ground colour is sharply cut off by an oblique white or rosy-white stripe, which runs with a faint curve from the dorsal margin near the anal angle to immediately below the apex of the wing, leaving a sharp point of the dark ground colour actually running into the tip; this white stripe is edged outwardly by a pale olive parallel line, followed by a broader pale olive-brown stripe along the hind margin, which last is edged with deep olive-brown, and outside this with white; cilia white, intersected and clouded with olive-brown. Hind wings rather large in proportion, pale smoky-brown, cilia rather whiter. Female closely similar.

Underside of the fore wings smoky-brown, streaked with yellowish-white toward the hind margin. Hind wings dusky white dusted with brown, and having a slender irregular brown transverse line beyond the middle. Body and legs brown.

Usually not variable; but there is in the museum at Carlisle a specimen believed to have been captured in the neighbourhood by Mr. C. Eales, in which the pale costal stripe is supplemented by another equally broad, joined to it for three-fourths of its length, occupying the middle portion of the wing from the base and throwing out a long spur toward the hind margin; in the middle of the wing is a spot of the darker ground colour. So far as I know this variation is unique.

On the wing from the end of May to the beginning of July; and there is a record of a second generation in August in a very hot summer.

LARVA slender, cylindrical, uniform in bulk throughout, save that the third segment seems a little swollen, and the last three taper slightly to the anal flap, which is bluntly rounded or almost squared off; head hard and globular, about as wide as the second segment; there are two pairs of ventral prolegs fully developed and effective, and the rudiments of another pair unused. Head yellowish-green; colour of the body full velvety-green with a pulsating dorsal vessel of a darker tint; subdorsal line slender, whitish-green; spiracular line broader, very pale yellow; hinder segments paler than the dorsal portion of the remainder; spiracles indistinctly brown; undersurface paler but still of a soft rich green. (W. Buckler.)

July and the beginning of August on *Carex sylvatica* and other sedges and coarse grasses. When at rest stretched out at full length on the leaves or blades of its food; looping in walking, and jumping about angrily if touched.

PUPA short and thick, greenish-brown. In a cocoon of earth and vegetable substances, under ground. (Hofmann.)

This moth is found only in marshy places, bogs, and fens. Its habits vary in some degree in different places. In the wet fens of Norfolk it hides among the coarse herbage in the daytime, but if disturbed will start up and fly to some little distance, then drop down into the herbage and hide at the roots, so that it can hardly by any searching be discovered, and can by no means (unless perhaps by smoke) be induced to fly again. But in dryer marshes, such as often surround fish ponds, where it is sometimes abundant, it behaves quite differently, starting up readily enough, but only to fly around for a few yards, to settle and rise again and again if followed. This contrast of habits I observed many times in the same localities. In the boggy districts of the south-west of Ireland it hides among the sweet gale (log-myrtle) and flies out with great readiness. In very hot sunshine it flies voluntarily and is sometimes extremely active, as also is

the case at its normal time of flight, from sunset till dark. Locally common in fens in the Eastern Counties; less frequent in the South, but not scarce in marshes, and in the West may sometimes be found in any tiny scrap of marsh or bog on a heath or by the side of a little stream; while in the more northern districts its haunt is in the "mosses." Probably sometimes overlooked, but it has been found on the marshy sandhills near Deal, Kent, and in boggy places on heaths in Dorset, in the Dartmoor district of Devon, and in Cornwall; in Somerset on the "moors"; in plenty in the fens of Cambridgeshire, Norfolk, and Suffolk; in Yorkshire at Askham bog, and in mosses in Cumberland. In Scotland it has been taken rarely in Kirkcudbrightshire, and very locally in Glenfalloch and elsewhere in Perthshire. In Wales abundantly in Glamorganshire, and more sparingly in marshes in Pembrokeshire. Much more plentifully in Ireland, where it sometimes abounds in the bogs of Kerry; also in Wicklow, Westmeath, Galway, and Louth. Abroad it occurs in suitable spots throughout Central Europe and the temperate portions of Northern Europe, in Piedmont, Turkey, Southern Russia, Tartary, and the mountain regions of Central Asia.

Genus 92. **AGROPHILA.**

Antennæ ciliated; eyes naked, without lashes; head squarely tufted; thorax slender, smooth, without crests; abdomen slender and smooth, but with one small depressed or prostrate dorsal crest; fore wings oblong, brightly coloured, the markings abnormal; hind wings plainly coloured, the cross-bar angulated; vein 5 curved, arising near to vein 4.

We have but one species.

1. **A. sulphuralis**, *L.*; **trabealis**, *Staud. Cat.*—Expanse $\frac{3}{4}$ to $\frac{7}{8}$ inch. Body slender; fore wings clear pale yellow, striped and spotted with black. Hind wings smoky-brown.

Antennæ of the male simple, minutely ciliated, dull black; palpi very small, horizontal, black, but covered on the inner surface with yellow scales; eyes black, naked; head very squarely tufted, pale yellow barred with black, and with a black tuft at the base of each antenna; collar black, divided, and also margined above and below, with yellow; thorax yellow, with a black stripe down each side of the middle, and another, shorter, on each shoulder-lappet; fascicles yellowish-white; abdomen yellow, with a broad cloudy black band across the basal half of each segment; lateral tufts large, yellow; anal tuft narrow, smoky-black. Fore wings oblong, not broad; costa very gently arched throughout; apex rather bluntly angulated; hind margin hardly oblique, very smoothly rounded; dorsal margin straight; colour clear yellow; a broad black stripe from the middle of the base, and another along the dorsal margin, run parallel until they unite with a more irregular black transverse stripe in the position of the usual second line; this last is twice constricted and in some individuals broken in its upper portion; on the costa, at a short distance from the base, is an oblique black spot followed by two others more rounded; below these in the discal cell are two more; a series of three or four black spots, often joined together by black dusting, occupies the usual situation of the subterminal line; extreme hind margin edged with black dots; cilia outside the apex white, remainder purplish-black minutely streaked with white. Hind wings rather broad, with the hind margin sinuous; smoky-brown with a purplish gloss, darkest along the hind margin; cilia white intersected with a brown line. Female similar.

Underside of the fore wings smoky-black in the middle, costa yellow, with a black spot beyond the middle and another at the apex; hind margin yellow, with black and white cilia; dorsal margin pale yellow. Hind wings straw-colour much streaked with smoky clouding; central spot a slender black crescent; beyond it is a curved irregular smoky-black trans-

verse stripe, and along the hind margin another. Body and legs pale yellow.

Variable in the shade of colour of the fore wings, from bright to extremely pale yellow; and in the size of the marginal black dots, those near the hind margin being occasionally almost obliterated. Mr. Herbert Goss has one in which they are almost totally so. On the other hand, in some specimens the black stripes are broadened and joined by cross black bars, or their margins clouded, considerably darkening the surface.

On the wing in June, and in a second generation at the end of July and in August.

LARVA, when full grown, about 1 inch long, having twelve legs; the body cylindrical, thickest at the fourth segment; the segmental divisions deeply indented; when at rest the middle segments are generally arched and the head bent down; colour rich chocolate-brown; dorsal line rather darker and edged with very fine paler lines; subdorsal line also darker but scarcely visible; spiracular stripe broad, pale yellow, and with a fine brown thread running through its length; in it are also some rich yellow and orange spots which after the last moult disappear, and the whole stripe becomes paler.

When first hatched a dingy little looper with a black transverse dorsal hump on each of the four middle segments, but at each moult these humps become less until nothing remains but the usual dorsal dots, black and distinct, and these also afterwards disappear. (Rev. J. Hellings.)

There is a green variety with white dorsal line and spiracular stripe, and the head, dorsal shield, and anal plate and legs brown; prolegs green.

July and September in two generations, on *Convolvulus arvensis* (field bind-weed), feeding upon both leaves and blossoms; very sluggish and hardly moving more than from one plant to another.

PUPA small, red-brown; among grass-stalks. (Hofmann.)

The moth frequents open fields, especially those which are roughly cultivated or lying fallow, or in which lucerne grows in irregular patches. It hides among the herbage, not particularly selecting its food plant, but rather the coarser plants which furnish better cover, such as lucerne, knapweed and scabious. From these it is readily disturbed in the daytime if the weather is fine, still more so if it is hot. It then flies briskly away to another patch to settle down, and again rise if followed, and requires careful approach and a quick hand for its capture. Between sunset and dusk it flies briskly of its own accord, keeping rather near to the ground. I have not met with it flying at night, but that it must sometimes do so is proved by the occasional though very rare capture of a specimen at light. An exceedingly local species in this country, almost restricted to the peculiar district of loose sand known as the "Breck-sand," which lies in the west of Norfolk and Suffolk and the east of Cambridgeshire; here it is moderately common, in some seasons very so, and is easily secured, but although its food plant is equally abundant over large extents of land throughout the country, the insect occurs elsewhere only in a very rare and casual manner. Donovan recorded in the beginning of this century that it had been taken at Margate, Kent, but was very rare. In 1847 its favourite haunt in this country seems to have been discovered by Mr. J. W. Dunning, who took several specimens at Brandon, Suffolk, and the next year many more. In 1858 or 1859 I found a scorched specimen in a gas lamp at Dulwich in the London suburbs. In 1860 it seems to have been rediscovered in the "Breck-sand" district, this time in Norfolk, and from that time onwards it has been constantly obtained around Thetford, Brandon, Tuddenham, and other places in that district, and is still to be found in apparently undiminished numbers. In 1871 single specimens were obtained at Erith, Kent, at the Hackney Marshes, Wandsworth, and at Lower Clapton, all three places close to London, so that there must in that year have been a very partial migration without

permanent effect. One has been secured in a gas lamp at Exeter, and one in Wicken Fen, Cambs. (by Mr. W. H. B. Fletcher). Two or three casual specimens each, on the south coast of Kent, near Dover and Folkestone, close the record for these islands. Abroad its range is extensive. Spain, Turkey, Syracuse, and the rest of Southern Europe, Central Europe, Asia Minor, Syria, Armenia, Persia, Turkestan, Afghanistan, Beloochistan, China, Japan, the mountain regions of Central Asia, Mauritius and Northern Africa.

Genus 93. **THALPOCHARES.**

Antennæ slender and short, ciliated; palpi short, ascending; eyes naked, without lashes; thorax smooth but with a minute back crest; abdomen slender, without crests; fore wings small, trigonate, rather brightly coloured but the normal pattern indicated; hind wings plain, with an angulated cross-bar. and vein 5 arising near to vein 4.

Very little is known of the larvæ or pupæ of our three British species, but Stainton says that the former have twelve legs, are thick, and pointed at each end. The moths may readily be discriminated—all are small insects, and likely to be overlooked at the first glance for members of one of the groups of micro-lepidoptera.

A. Fore wings purple-brown or grey-brown, a brown streak from the base, the cross lines arranged in loops. *T. ostrina*.

A². Fore wings fawn colour, first line direct, oblique, darker. *T. parva*.

A³. Fore wings pale greyish-drab, both lines oblique, rather direct, white. *T. paula*.

1. **T. ostrina**, *Hüb.*—Expanse $\frac{3}{4}$ to $\frac{7}{8}$ inch. Body slender; fore wings trigonate, brownish-white streaked with olive-brown and black and shaded with purple, lines in pointed curves. Hind wings brownish-white.

Antennæ of the male small, slender. brown; palpi small,

oblique and curved up, moderately tufted, white, tinged outside with purple-brown; eyes prominent, black; head smooth, dull brown or white; thorax slender, smooth, pale greyish-brown or brownish-white, the crest or tuft at the back very small; fascicles white; abdomen slender, greyish-white, without lateral tufts, anal tuft pointed, very small. Fore wings rather triangular, costa very faintly curved, nearly straight; apex bluntly angulated; hind margin a little oblique, gently rounded and expanded near the anal angle, where the cilia are rather long; dorsal margin straight; colour brownish-white, often suffused with pale purple; a black-brown basal streak lies below the base of the median nervure, and a minute one below that of the subdorsal; first line near the middle of the wing, as an irregular tawny-brown shade, or series of broken streaks, almost thrown into loops; second line white, oblique, very irregular, indented and almost looped, with long black and white points thrown back; between these two lines is a broad band of pale purple-brown, streaked in its costal portion with white, with black-brown in the remainder; hind-marginal region striped alternately with fawn colour and brownish-white, the extreme margin with chestnut; cilia white, intersected and tipped by brown shades. Hind wings rounded, smoky white with a golden gloss, darkest along the hind margin; cilia white. Female similar. Dr. Wallace states that specimens of the second brood are smaller and yellower than those taken in June.

Underside of the fore wings white, much clouded with smoke colour in the upper half, but the costa streaked and spotted with white. Hind wings white with a small central dark dot and a faint smoky hind-marginal cloud. Body and legs white. Variable in the degree of purple shading, which sometimes is nearly absent.

On the wing in June, and as a second generation in August and September. Where more at home, in the South of Europe, from April till October.

LARVA apparently undescribed. Staudinger says that it feeds in shoots of thistles; Hofmann that it lives in three generations on *Helichrysum angustifolium* and *Carlina vulgaris*.

PUPA undescribed.

Scarcely anything is known with us of this very rare species. It has been taken flying in bright sunshine, but apparently only when disturbed from its resting-place among brambles and other herbage; probably it flies naturally about sunset. The first specimen recorded in this country was taken in June 1825 by Capt. Blomer, near Bideford, Devon, and was given to Mr. Curtis, by whom it was figured. No other specimen seems to have occurred for upwards of thirty years, but on the 8th June 1858 one was secured by Miss Battersby on the sea coast near Torquay, South Devon. This fortunate capture induced Dr. Battersby with his family to search along the coast wherever the cliffs were accessible, and in the next two days several more were secured; about the same time and upon the same coast two more were seen, and one captured, by another observer; and two were obtained by Dr. Wallace in the Isle of Wight. In the same year a single specimen was taken in Ayrshire, Scotland, and recorded by Mr. J. P. Duncan. It was disturbed from a clump of thistles on the sandhills near Troon and captured by Mrs. Duncan. Dr. T. A. Chapman saw the specimen shortly afterwards, and is fully satisfied of the truth of the statement, and of the correctness of determination of the species. The next year Dr. Wallace recorded six specimens taken in hot sunshine on the Culver Cliffs in the Isle of Wight, but of these it is reasonable to believe that two were those previously mentioned, which had been exhibited at a meeting of the Entomological Society the year before. In 1865, Sir J. T. D. Llewelyn recorded the capture, by himself a few years earlier, of a specimen on the sandhills at Pembrey, South Wales. He says: "The spot where I secured it was rather barren and sandy, in a sheltered situation. An

abundance of dwarf-sallow grew in the vicinity, and also, as far as I can remember, thistles, bedstraw, wild thyme, and a short kind of grass, from which latter I expect that I disturbed it; at any rate the insect was flying low over the barren sand when I caught it. The day was showery, with occasional gleams of sunshine. During one of these gleams I took the insect." Possibly some small migration of this species may have taken place about 1858. At any rate, I know of no subsequent capture in Wales, and of very few indeed elsewhere! These seem to have been in 1880, when one was secured on September 8th on the cliffs at Dover by Dr. Battershell Gill, and another near Swanage, Dorset, by the Rev. C. R. Digby. I am not aware of any subsequent captures, and its range, if it may so be called, seems to be limited in this country to Kent, Dorset, Devon; Glamorganshire in South Wales; and the single capture in Ayrshire, South Scotland. Abroad it is found in France, Southern Germany, Spain, and most other parts of Southern Europe, including Turkey; Madeira, Egypt, Morocco, Algeria, and other parts of Northern Africa; and the Cape Colony, South Africa.

2. **T. parva**, *Hüb.*—Expanse $\frac{1}{2}$ inch. Small and very slender, fore wings pale fawn colour shaded with white; a straight oblique richer brown central stripe is edged outwardly with white; hind margin shaded with orange-brown. Hind wings smoky brownish-white.

Antennæ of the male very small, simple, light brown; palpi ascending, white; eyes large and prominent, black; head and thorax smooth, white or brownish-white, the knob or crest at the back of the latter minute; fascicles white; abdomen pale brown barred with white, lateral and anal tufts small. Fore wings rather triangular, costa faintly rounded; apex bluntly angulated; hind margin oblique and very faintly curved; dorsal margin straight; pale fawn colour shaded with white; first line near the middle of the wing, straight and oblique, forming the edge of an oblique transverse deeper fawn-

coloured band which is edged outwardly by black dusting and outside this by a more oblique white stripe ; this shades off gradually into another band of pale frosted purplish-brown, the outer edge of which is the usual second line, tolerably direct, oblique, and composed of brown and black dusting. this in the middle throws out a curve or swelling ; a yellow-brown or red-brown cloud lies above the anal angle, and a lighter brown cloud containing black dots beneath the apex ; these are edged by the obscure, and partial, white subterminal line, outside which the soft fawn ground colour is shaded with white ; close to the base of the wing, in the discal cell, is a small black dot, and several more, very minute, are placed in the situation of the reniform stigma ; cilia white shaded with fawn colour. Hind wings white at the base, shading off to smoky-brown at the hind margin ; cilia white. Female similar.

Underside of the fore wings white, shaded with smoky-brown, especially toward the costa, on which toward the apex are alternate white and black dots. Hind wings white, faintly dusted with brown and shaded with pale yellow. Body and legs pale brown.

A little variable in depth of colour of the fore wings, of which the base is sometimes quite white, and the bands, especially the outer, vary from the softest obscure fawn-brown to chestnut or purple-brown.

On the wing in June and July ; but in its home in Southern countries, during the whole season, even from January, but most plentiful in August.

LARVA apparently undescribed. In the flower shoots of *Inula montana*, *I. viscosa* and *Centaurea calcitrapa*, in October and November.

PUPA undescribed.

This is even a greater rarity in this country than the last, and scarcely anything is known here as to its habits. The first specimen known to have occurred with us was captured

in July 1844 by the late Mr. C. Jordan and Dr. R. C. R. Jordan at Teignmouth, Devon. The latter says: "It came to light as we were sitting by an open window facing the river." This specimen he also allowed me to examine, and of its identity I am fully satisfied. In 1858 another was recorded as taken in June at Weston-super-Mare, Somerset, by Mr. W. D. Crotch. Since then there have been reports of specimens captured in the Isle of Wight, and even the Isle of Man, all of which seem to require confirmation. There is no such necessity, however, in the case of one secured in the Isle of Purbeck, Dorset, on the 8th of June 1892, by Mr. Enstace R. Banks. He says: "The greatest prize this year was met with when I was working a salt marsh at the edge of Poole Harbour. As I was walking slowly along the border of the marsh at about 6 P.M. a queer-looking pale moth flew up from among the rushes under my feet and settled again three or four yards further on and *within a foot* of the edge of the water. As there was a strong breeze blowing straight off shore across the harbour I crept up cautiously (with my heart in my mouth) and held my net over the water behind the moth; then on my bending down to try to box it as it sat it flew up and was carried by the wind safely into the bottom of the net."

The very reasonable conclusion of its captor was that it might have migrated from the Continent in company with the myriads of *Colias Edusa*, *Vanessa cardui*, and other species which had undoubtedly about that time crossed the Channel. These are all the captures of this species with the details of which I am at all acquainted. There is an example in the collection of the late Mr. Bond, but it is unfortunately unlabelled. Abroad it is found throughout Southern Europe, including Turkey; Syria, Asia Minor, some parts of India; Egypt, and Morocco, and doubtless other parts of Northern Africa.

3. **T. paula**, *Hüb.* — Expanse $\frac{2}{3}$ inch. Body slender,

fore wings triangular, pale greyish-drab with both lines white, edged with pale reddish-brown, oblique and rather direct. Hind wings pale smoky-brown, paler at the base.

Antennæ of the male small, simple, light brown; palpi small, upraised, white; head and thorax smooth, white; the tuft at the back of the latter extremely minute; abdomen dusky-white; anal tuft tinged behind with brown. Fore wings triangular; costa nearly straight; apex and hind margin rounded, the latter full above the anal angle; dorsal margin straight; colour pale greyish-drab, base white clouded with pale brown; first line represented by an oblique white line edging a broad equally oblique reddish-brown stripe; second line similarly oblique and direct, white, forming the inner boundary of an obscure reddish-brown cloud, which in its dorsal portion seems to form a partial stripe and thence fades off; on the costa are three cloudy white spots; subterminal line perceptible as the outer whitish edge of the cloudy band which borders the second line; along the hind margin is a more distinct whitish line; cilia dusky white clouded with pale brown. Hind wings smoky-white shading off to pale smoky-brown near the hind margin and still darker before the cilia, which are white. Female similar.

Underside of the fore wings grey-drab, shading off to dusky white at the base and dorsal margin; costa narrowly paler; cilia dappled with paler dashes: hind wings white; body and legs brownish-white.

Apparently not variable.

On the wing in July and August.

LARVA. Head dark green; body whitish-green with a slender double darker dorsal line; hairs minute, white, arising from black raised dots; spiracles white, ringed with black; dorsal plate brownish-yellow. June, in the stems of *Gnaphalium arvenarium*. (Hofmann.) It also feeds on other species of *Gnaphalium* (Cudweed).

PUPA thick, yellow-brown, in the earth among the roots of its food-plant. (Hofmann.)

Nothing, or next to nothing, is known here of the habits of the moth. The first record of its occurrence in this country was in 1873, of two specimens in the collection of the Rev. Henry Burney, the origin of one of which was doubtful, but of the other the statement of the owner was as follows: "It was picked out from an old collection made years ago by a boy at school, and its rarity never suspected until I looked over the insects and discovered the little stranger, which was placed in my cabinet under another (erroneous) name. The boy in question was in the habit of collecting during the holidays upon the South Coast, and as he had no opportunity of getting insects from abroad or from dealers there seems no reason to doubt the genuineness of the specimen." These two examples are now in the collection of Mr. P. M. Bright at Bournemouth. Another was captured by Mr. J. Moore at Freshwater, Isle of Wight, in June 1872. He says: "I took it in a cornfield close to the cliffs. A friend and I were in search of another species at the time, and at first I thought it a *Tortrix* and took little notice of it, but put it among my unset insects. A friend looking over them after my return pointed this one out to me, and I relaxed and set it, and exhibited it at a meeting of the Haggerstone Entomological Society as *parva*." I have seen this specimen, and found it to be without question the present species. This is confirmed by Mr. Eustace R. Banks, in whose possession the insect now is. I know of no other instances of its occurrence in these islands. Abroad it is found in the South of Sweden, South of France, Germany, Hungary, Switzerland, Livonia, and Southern Russia.

GENUS 91. **ERASTRIA.**

Antennæ ciliated; eyes naked, without lashes; thorax narrow, crested at the back, and the collar raised; abdomen slender, having three or four dorsal crests. Fore wings short, somewhat ovate, broad behind, the markings more of the normal character; hind wings plain, cross-bar angulated; vein 5 curved, arising near to vein 4.

We have but one species.

1. **E. fuscula**, *Blh.*; **fasciana**, *Staud. Cat.*—Expanse 1 to $1\frac{1}{8}$ inch. Body rather slender; fore wings broad, blackish-brown, with a very large ovate white blotch occupying much of the hind-marginal space above the anal angle; stigmata edged with white. Hind wings pale smoky-brown.

Antennæ of the male simple, shining purplish-black, barred at the back with white; palpi oblique, rather prominent, yellowish-brown inside, outwardly dusky-black; eyes prominent, black; head rather smooth, purplish-black dusted with white; thorax narrow; collar small but raised and well divided, mixed black and brown, and edged in two arches with white; remainder of the thorax possessing a frosted appearance, the black-brown scales being each tipped with white; at the back is a broad raised convex crest, and immediately beneath it a drawn-together tuft of scales; fascicles small, white; abdomen slender, black-brown, abundantly dusted with white, on each of the first four segments an erect black dorsal crest, those on the third and fourth the largest; lateral and anal tufts tipped with whitish-brown. Fore wings short, blunt, and very broad behind; costa gently arched; apex angulated; hind margin below it hardly curved and nearly perpendicular, but bent or elbowed in the middle and much more oblique below, yet with the anal angle distinct; dorsal margin straight; colour black, abundantly dusted with golden-brown; basal line indicated

by two or three small black spots edged with cloudy-white ; first line rather upright, much angulated, formed of obscure white dusting ; second line deep black, rippled throughout and much bent, and followed by a more slender similar parallel line ; between these parallel lines and broadly outside them a large ovate white blotch from the dorsal margin extends more than half-way across the wing, occupying a large portion of the hind-marginal space, its outer area rather dusted with black ; subterminal line white but obscure and much waved, and broken before reaching the costa ; orbicular stigma golden-brown, edged by a dusting of white ; reniform stigma similar, with a more definite outline of white, and a black spot in its base ; claviform stigma faintly indicated by white dusting in a black curve ; between the two upper stigmata is a black blotch devoid of the golden-brown dusting ; a similar streak runs from it to the costa ; just outside the reniform stigma is a sort of imitation thereof, and beyond this are several longitudinal black streaks ; extreme hind margin edged with short black lunules ; cilia long, grey-brown dashed with white, and intersected by a black-brown line. Hind wings rounded, shining pale smoke colour ; cilia white, dashed and intersected with smoky-brown. Female similar.

Underside of the fore wings smoky-black, with an obscure, dusky yellow, curved transverse stripe just beyond the middle. Hind wings yellowish-white dusted with black, and shaded with brown toward the hind margin ; central spot a black dot ; beyond it is a very slender transverse line of black dusting. Body and legs whitish-brown dusted with black ; tibiæ barred with black.

Usually very constant in colour and markings. Among the insects from Haworth's collection, now in the possession of Dr. P. B. Mason, is one labelled *Albilinea*, which is certainly an example of this species, having the usual white blotch, and the apical region grey, except a white line between the two parallel second lines.

On the wing in June and July, sometimes even at the end of May.

LARVA $\frac{3}{4}$ inch long, rather slender, even in bulk almost throughout; the twelfth and thirteenth segments taper a little; head full and round, light brown; the prolegs on segment seven absent, on eight rudimentary, those on the two following segments well developed; colour on the back pale yellow, with a broad greenish pulsating dorsal vessel; subdorsal line thin, clear yellow, edged above with brown, and below with pale green; spiracles round, black, placed on a thin reddish line; raised dots dusky-black edged or ringed with pale red; undersurface yellow with its dots black; anal prolegs frequently purplish. Sometimes of a more reddish tint, each longitudinal line edged with more decided red; a brownish stripe between the lower edging of the subdorsal and the spiracular line; and below this again a yellow line, then a red line, and the undersurface pale brown. (Buckler.)

July to September on *Molinia caerulea* (blue moor-grass) growing in damp places. (Buckler.) I am inclined to think that some other stiff hard grass must also be eaten, since the *Molinia* does not seem to grow in some of those woods in which I have found the moth most plentifully.

PUPA cylindrical, stout about the thorax, the abdomen smaller and short in proportion, ending rather bluntly in a spike set with several curled-topped spines; the skin very glossy, rich red-brown; wing-cases more golden-brown; eyes blackish. In a cocoon very firmly and neatly made of a thin coating of silk stuck all over with fine earth or sand. (Buckler.)

The moth sits during the day, head downwards, upon trees, especially fir-trees, and when approached often darts down toward the ground and tries to escape among the undergrowth of brambles, heather, or whortleberry. There

is hardly any moth more deceptive in appearance. The large white blotch shown when the wings are shut together, with the dark dusting and lines in its margin, has so absolutely the appearance of a patch of white lichen that one may look straight at it and be unable to realise that it is a moth. This, and the activity and suddenness of its first movements into the undergrowth, where the latter is present, serve as a considerable protection from capture. When it sits, as is often the case, between the dead lower branches of young firs, it usually contrives to elude the net. Where the fir-trees are large it is more readily secured, and those which sit out of reach may be induced to dart down by the blow of a heavy stick on the trunk. In the South-west of Ireland it is said to avoid the fir-trees and to sit upon the stems of *Myrica gale* (sweet gale), and the common bracken fern, at the edges of the bogs. With us it is certainly most attached to those woods which are surrounded by, or mixed with, heath, and which have damp marshy spots full of stiff hard grasses.

In such spots it is abundant in the New Forest and Woolmer Forest, Hants, in Surrey, and Berks; also found in moderate numbers in Kent, Sussex, Dorset, around Dartmoor and elsewhere in Devon; rare in Cornwall; not very common in Somerset, Gloucestershire, Herefordshire, Oxfordshire, and Cambridgeshire; more so in Essex, Suffolk, and Norfolk; and local in Worcestershire. I find no records for the Midlands nor for any locality north of those here noted. At one time it occurred in the immediate neighbourhood of London on the Kentish side, but has now disappeared from that district. In Wales it is found in Glamorganshire, and there is a record from North Wales. In Ireland abundant in the bogs of some parts of the County of Kerry, but apparently not otherwise noticed. Its range abroad is through Central Europe, Northern Italy, Sicily, Corsica, Livonia, Southern Russia, Armenia, the mountain regions of Central Asia, and Japan.

Genus 95. **BRYOPHILA.**

Antennæ ciliated, tufted at the base ; eyes naked, without lashes. head much tufted and rough, thorax slender, and with a flattened prostrate back crest ; abdomen smooth but with several dorsal crests ; fore wings oblong, rather uniform in breadth ; hind wings thin, the cross-bar very obscure. vein 5 arising near its middle.

LARVÆ smooth with large shining raised spots. On wall and rock lichens, forming habitations therein for concealment during the day.

PUPE of ordinary form, in similar habitations.

We have but two species, readily separated.

A. Fore wings white, marbled with slate grey ; hind wings with transverse grey stripes and a central dark spot.

B. perlæ.

A.² Fore wings some shade of green, usually with black markings ; hind wings nearly plain. *B. glandifera.*

1. **B. glandifera**, *Hüb.* ; **muralis**, *Staud. Cat.*—Expanse 1 to 1 $\frac{1}{4}$ inch. Body slender ; fore wings some shade of pale green or olive-green, marbled with black lines and curves ; costa spotted with black and white ; hind wings pale smoky-grey or smoky-white.

Antennæ of the male simple, minutely ciliated, leaden brown ; palpi curved up, slenderly tufted, white, broadly barred with black, the terminal joint long and pointed ; eyes prominent, deep black ; head moderately tufted with raised scales, brownish-white or greenish-white ; thorax narrow, green, with a rather loose flattened back crest tipped with white ; shoulder lappets rather uplifted ; fascicles white ; abdomen whitish-brown thickly dusted with dull brown, but with a white band along the hinder edge of each segment ; on the dorsal ridge are three or four short oblique white

crests tipped with black ; lateral and anal tufts small. Fore wings oblong, a little broader behind ; costa very faintly arched or almost straight ; apex bluntly angulated ; hind margin slightly oblique and very little curved to below the middle, where it is bent in, and above the anal angle almost hollowed ; dorsal margin straight, colour dull green, bluish-green, olive-green, or brownish-green, fading to yellow-green ; basal line slender, broken, angulated and curved, deep black ; first line equally black, thicker, rather angulated, edged inwardly with white, terminated at some distance from the dorsal margin ; second line also black, slender, rippled into numerous small crescents, edged outwardly with white, terminated at some distance from the costa ; sub-terminal line an interrupted series of angulated black markings, broken and abruptly set back before the costa, where it forms three parallel streaks ; orbicular and reniform stigmata rounded, olive- or smoky-green, edged with deep black ; beneath the former is a rather squared similar spot similarly edged, but larger ; costal margin regularly spotted with black, the intermediate spaces filled in with white ; extreme hind margin regularly spotted with minute Y-shaped black streaks which project into the cilia, the latter being otherwise greenish-white. Hind wings rounded behind, very glossy, smooth, pale smoky-grey or smoky-white, palest toward the base ; central spot a hardly perceptible smoky-black crescent ; near the hind margin is sometimes a faintly visible partial blackish transverse line ; hind margin edged with black ; cilia white. Female very similar, but with the abdomen broader and rather flattened.

Underside of the fore wings shining smoky-brown, shading off to white along the dorsal margin ; costal margin spotted and shaded with white ; cilia white with smoky-brown dots. Hind wings smoky-white, dusted with brown ; central spot a black crescent ; along the hind margin is a broad smoky-black stripe shading paler toward the anal

angle. Body and legs greyish-white; front tibiae white, broadly barred with black.

Variation is, as above indicated, very great in the shade of ground colour on emergence, and this is complicated by a tendency to fading even during life, but much increased after death. There is also irregularity in the distinctness of the black markings, which sometimes are thick, very conspicuous and deep black, in other examples slender or partially suppressed, and in one well-known variety devoid of the black pigment, and changed into olive-brown shades most visible from their whiter edgings. In a form which has the ground colour very pale-green, almost pale yellow, these lines, though black, are the merest fragmentary indications or edgings of lines; other specimens, again, are of peculiar brilliancy both in colour and markings; some such, of a most brilliant green, have been obtained on walls in the Kentish coast towns, and among them I have seen one of a dark-green colour having the lines *white*. Still more remarkable for their extreme variations are specimens from South Devon. In a series of these sent up by the Rev. C. F. Benthall of Starcross are specimens having the usual black markings, but the ground colour very dark deep green, or in another case orange-brown; others blue-green or grey-green, with the black markings either sharply edged with white or exchanged in part for white; another of an orange-olive colour, in which the black and white markings are spread out into clondy-black, and more slender white, stripes; another in which the ground colour of the right fore wing is dull green, that of the left pale smoky-grey; another has the fore wings white, with faint yellowish-olive suggestions of the usual markings; and again, another has the outer margins of these wings whitened. From the same district, Mr. F. C. Woodforde has brought a specimen of which the ground colour is pale yellow banded with orange ochreous between the very slender black markings. A series of specimens taken at Chippenham, Wilts, by Professor

Meldola, has the series of black dots along the costal margin doubled, so as to be very closely and regularly ornamented with sharp black spots; among these is one of an otherwise unicolorous green, and another equally devoid of black lines, but of a buff colour. Mr. R. Adkin has a singular form, obtained from Cork in the South of Ireland, almost unicolorous dull greenish-slate, with the markings only faintly indicated; also others somewhat similar from the Scilly Isles, along with some more strongly marked, but leaning toward the peculiar Cambridge form. It is time that this curious local race should be mentioned, since it is supposed by some to be a distinct species, and has been commonly recorded under the names of *par* (which belongs to another variety) and *impar* (which was simply a joke). It has rather a robust appearance, especially in some examples, and in a few the base of the fore wings seems slightly narrower, so as to give them a more triangular form; the ground colour often shows no trace of green, but is white, greyish-white, or brownish-white; the markings more obscure, cloudy, or shaded off, and the whole surface dusted with grey or clouded with black. This form is found year by year upon the walls of the colleges at Cambridge University, and on houses in that city, and is very rarely mixed with normal specimens; on the other hand, the variation in coast specimens extends so as to unite with and include this; indeed individuals inseparable from the Cambridge specimens have been taken at Deal. It is difficult to do justice to the endless variations of a species like this.

On the wing in July and August, and occasionally into September.

LARVA smooth and soft, rather limp, slightly thickest in the middle, head smaller than the second segment, prominent, shining, deep black, with the mouth white and rather hairy; body rather flattened above and below; green or smoky-green or grey-green, the raised dots shining, almost metallic,

paler; undersurface pale green or yellow; dorsal plate black, divided by the commencement of a white or yellow dorsal line, which is continued as a dorsal row of elongated yellow streaks or spots, one on each segment; subdorsal lines sometimes shown on the dorsal plate as lines, in other cases as dots, in all continued in dots of white or yellow on the body segments; legs dull green or greenish-grey. When just hatched the young larva is black and hairy, afterwards more grey, and only gradually assumes the greener colouring.

October till May on the minute powdery or scaly lichens, especially yellow lichens, which grow upon the perpendicular surfaces of walls and rocks; feeding upon these only when moist with dew or rain, and usually at night or early morning; making for itself a chamber of silk and lichen on the surface, or in a crevice, and there hiding during the day, or even for days and nights so long as the weather remains dry and without dew. So much is this the case, that in long spells of drought it will sometimes become quite thin and starved, the head looking large in comparison to the shrivelled body, but should rain commence it will occasionally come out from this chamber to feed in the daytime. It is said not to return always to the same domicile, but will enter any such chamber which it finds open and empty, and close it up, while the lawful owner will travel farther till it also finds an empty chamber, with the same result, no larva ever striving to eject another, but if unable to find a chamber ready-made searching out a suitable crevice and quickly building a new home. Unfortunately the sparrows, with the peculiar instinct for mischief with which those familiar birds seem to be provided, have discovered the secret of these lichen-covered chambers, and may often be seen clinging to a wall, and giving themselves ten times as much trouble as it would cost them to find some common but injurious larva, to hunt out and devour this perfectly harmless tit-bit. The house in which Mr. G. C. Bignell—some of

whose drawings of larvæ are figured in this work—used to live, was opposite to a portion of the dockyard at Stonehouse, which was surrounded by a massive wall overgrown with minute lichens; from his front windows the operations of the sparrows up and down this wall were plainly visible. Hybernation takes place when very small, doubtless in a similar but smaller chamber.

PUPA apparently undescribed, either in the larval chamber or a loose cocoon among moss, or in a chink of the wall, but so accurately covered with the material of the wall as to be almost undistinguishable.

The moth sits in the daytime on walls and rocks, and though sufficiently visible to a trained eye, is undoubtedly protected to a great extent from its enemies by its close resemblance to a small patch of lichen. It flies at dusk, and comes readily to sugar in its very restricted localities; also has been taken at clematis blossom and at light. When attention was first called by Mr. W. Warren to the peculiar form inhabiting Cambridge he found several of his specimens *inside* houses. This may have arisen from some unusual cause, such as a violent wind; at least I do not hear that such a habit has been further observed. Common on old walls at Sheerness, Deal, Dover, Folkestone, and probably all coast towns in Kent, and at Brighton, Lewes, Eastbourne, and elsewhere in Sussex; more local in Dorset, where it has been found in the Isle of Purbeck; common again in the coast towns of Devon from Sidmouth to Plymouth; also on the north coast, and in Cornwall and the Scilly Isles; more local in Somerset. In this county it is found also inland, at Bath and Wells; in Wiltshire at Marlborough and Chippenham; and extends into Gloucestershire. The Cambridge locality, already so much alluded to, seems to be quite an isolated out-station, since I know nothing of its occurrence in the surrounding towns, and it is certainly very scarce in the rest of the Eastern district, being recorded as rare in

Suffolk, and taken only once—by Lord Walsingham—in Norfolk. In Wales it is probably widely distributed on the coast, since it has been found in plenty at Swansea; also at Laugharne, Carmarthenshire; and I took one specimen on a rock near Saundersfoot, Pembrokeshire, and two on walls at Pembroke. It is also recorded at Pwllheli, North Wales. In Ireland in the counties of Cork and Galway. Abroad its range seems to be restricted to Central and Southern Europe, Asia Minor, and Armenia.

2. **B. perla**, *Fab.*—Expanse 1 to 1½ inch. Body slender; fore wings white, mottled and marbled with bluish-grey; costa and hind margin dotted with black. Hind wings white, shaded and barred with smoky-grey.

Antennæ of the male short, simple, rather fully ciliated, purplish-brown, barred at the back with white; palpi small and slender, white, shaded on the basal portion with black-brown; eyes prominent, deep black; head rather strongly tufted, white, a distinct white tuft at the base of each antenna; thorax slender, rather coarsely scaled, white, the back crest prostrate, tipped with dark brown; fascicles white; abdomen slender, white, the basal portion of each segment clouded and dusted with brown; on the back of the first segment is an obscure oblique white crest tipped with brownish-black; lateral tufts very thin; anal tuft thick, yellowish-white. Fore wings rather oblong; costa gently arched; apex rounded; hind margin also gently rounded, not very oblique; dorsal margin rather full; colour white, shaded and marbled with bluish-grey; basal line deep black, angulated, incomplete; basal area within it tinged with grey; first line very perpendicular, repeatedly angulated, black, not attaining the costa; second line also black, slender, abundantly rippled and angulated, bending outward below the reniform stigma, above it curving back and running parallel with the costa; subterminal line an obscure and incomplete series of black dots and angles; orbicular stigma

round, ill-defined, slate-grey, its margin rather streaked with black but quite open below, where it joins a large slate-grey cloud from the dorsal margin; reniform stigma large, slate-grey, edged with white and some black dots and streaks; costal margin distinctly and regularly spotted with black. the last two spots towards the apex obscured in another smaller slate-grey cloud; hind margin more faintly clouded with the same, and edged with a series of short black streaks; cilia white, regularly chequered with slate-black. Hind wings white, shaded with smoky-grey; central spot large, dull black; before the hind margin are two parallel smoky-grey transverse stripes, forming a broad band, ill-defined, shaded off, and frequently quite obscure, usually showing in its extreme margin a series of white spots; cilia dusky-white. Female very similar, but the body stouter and more flattened; very often the slate-grey or blue-grey clouds of the fore wings are more extended, and of a deeper tint, and the hind wings more darkly shaded.

Underside of the fore wings white round the margins, the middle portion being occupied by a large smoky-black cloud from which similar bars are thrown off to the costal edge; hind margin dotted with black and dusted with grey. Hind wings white with the nervures black; central spot elongated, black; near the hind margin is an irregular, ill-defined, cloudy-black transverse stripe. Body and legs white; tibiæ barred with black.

Variation in this species is in most localities but slight, merely in the extension of the bluish-grey cloudy markings on the white ground; but in some places, especially upon the coast, this is intensified, and the darkness of both fore and hind wings in some of Mr. S. Webb's forms taken at Dover is remarkable. Some equally dark, and even of a deep slate-green or greenish-black tint, have been found in the neighbouring town of Folkestone. From other places, both on the coast and inland, specimens are obtained in which the slate-grey markings are exchanged for yellow, or even pale orange,

or the whole wing is tinged with pale yellow. Mrs. Bazett has a specimen, taken at Reading, Berks, of which the ground colour is uniform smoky pale brown, without a tinge of white, the dark markings visible, but obscured by the general smoky-black clouding. On the other hand, Mr. F. N. Pierce has a fine white specimen in which the markings are only most slenderly indicated. But the most remarkable aberration known to me in this, or almost in *any* species, is a specimen in the collection of Mr. S. J. Capper, in which the fore wings and right hind wing are normal, but the left hind wing has a wonderful reproduction of markings of the fore wing, as though they had been printed on it in reverse, the angulated black lines and the white intermediate spaces being very distinctly and wonderfully shown.

On the wing in July and August.

LARVA short and stout, rather even in thickness, a little flattened above and beneath; head rounded, shining black; dorsal region of the body down to the subdorsal lines occupied by a broad orange-red stripe in which the dorsal line is represented by a series of heart-shaped or bottle-shaped black spots; subdorsal stripes black or formed of short black streaks; remainder of the body bluish-slate colour; spiracular lines indicated by a slender black thread, or by a fine white line, or even two; raised dots black and glistening; spiracles black; legs slate-colour or more faintly greenish.

August to May on *Lecidea confluens*, "a crustaceous lichen which dots over old walls with its cracked and weather-beaten patches," also other minute lichens which grow upon walls. The observations of Mr. P. Inchbald, made forty years ago, are worth reproducing: "We have a colony that have fixed their quarters on the house side. During the day they carefully secrete themselves in their *sand nests*; as they take care to make up the doorway on entering their retreats there is no chance of catching a glimpse of them then. The early morning is their time of feeding; then old and young

are out, but soon after nine they retire for the day. The shields or tubercles of the *Lecidea* are the chief attraction; these they gnaw, removing the black crusts and exposing the white undersurface to view. Their depredations are thus readily seen in the morning, as the white tops are very conspicuous in the sunshine. To watch their building operations more narrowly, I removed a dozen of them from their quarters on the house-side, and built them a tiny rockwork of lichen-covered stones, covered over with a bell-glass. Here they soon busied themselves in constructing new nests, gnawing off fragments from the stone, and cementing them together with all possible care. They fed, when thus kept, in the early part of the day, withdrawing to their nests when breakfast was over. Sometimes, by moistening the stones, I could invite them out during the day, but when this was not done they usually remained at home till the following morning."

PUPA light shining brown. Not more fully described. In the chamber which has served the larva as a habitation.

The moth sits very flatly upon walls, and is easily visible; indeed, when the walls are of brick, it is sufficiently conspicuous. It flies at dusk and at night, and is very strongly attracted by light, sometimes coming in numbers to the street lamps. Also in some small degree attracted by sugar, and has been taken at flowers of red valerian. Its attachment to walls is remarkable; it seems very rarely to sit willingly upon anything else, having an evident repugnance against trees and plants. Possibly it may sometimes frequent rocks, but this I have not seen. Common all over England, Wales, and Ireland, and some portions of the East of Scotland, much less so in the West of Scotland, and apparently not found north of the districts of the Tay, Dee, and Clyde. Abroad it is common in Central, Southern, and Western Europe, the South of Sweden and Norway, and the North of Italy.

(**B. algæ**, *Fab.*—This species has the fore wings dark smoky-brown or smoky-black, marbled with green and olive-green, the base, and sometimes one or two blotches beyond the middle, pale green; hind wings smoky-white.

In the year 1859 a short announcement was made that two specimens had been taken in the Manchester district in July of that year. These two examples appear to have been brought by a workman, alive, to the late Mr. Joseph Sidebotham; and they are still, I believe, in his collection in the possession of his son, Mr. J. W. Sidebotham, M.P. No other case of the occurrence of the species in these Islands is known, and it can only be supposed that these two specimens were by some accidental means introduced. It is common in Central and Southern Europe, Asia Minor, and Armenia.)

Genus 96. **PHYTOMETRA.**

Antennæ faintly ciliated; eyes naked, without lashes; thorax smooth, not crested; abdomen short, smooth, without crests; fore wings short and small, bluntly trigonate; hind wings narrow, yet with a wide cell and the cross-bar long; vein 5 curved and arising near to vein 4, but strong, distinct, and filling out its portion of the margin.

We have but one species.

1. **P. ænea**, *Hüb.*; **viridaria**, *Stand. Cat.*—Expanse $\frac{3}{4}$ to $\frac{7}{8}$ inch. Body short and rather thick; fore wings dull brown or yellow-brown, with a faint olive tint, usually with two broad oblique dull crimson or purple transverse stripes. Hind wings dull smoky-brown.

Antennæ of the male short, simple, minutely ciliated, dull brown; palpi small, slender, blackish-brown, the apical joint pointed and distinct; eyes naked, black; head rather tufted, olive-brown; collar black-brown with a purple tinge; remainder of the thorax smooth olive-brown; fascicles similar; abdomen smooth, tapering, yellow-brown dusted with darker,

and without dorsal crests ; lateral and anal tufts compressed. Fore wings short, trigonate, narrow at the base ; costa almost straight ; apex sharply angulated ; hind margin oblique, rather straight, but usually a little curved off toward the anal angle ; dorsal margin straight ; colour dull brown or yellow-brown, with a faint olive tint to the middle, the hinder half of the wing occupied by two rich purple parallel bands between which is a slender stripe of the ground colour, and sometimes the inner band is faintly clouded or shaded with the same ; a slender purple stripe also lies along the base of the costa ; cilia brownish-purple. Hind wings rather long and narrow, rounded behind ; very dull brown with a faint olive tint, darker toward the base, and sometimes having a darker transverse cloud in the middle, or a stripe of dusky purple clouding along the hind margin, but very obscure ; cilia long, whitish-brown shaded with purple. Female smaller, with shorter, thicker body ; fore wings shorter and more uniformly of a darker olive-brown ; the hind wings more blackened and the cross-band of darker brown in them often more noticeable ; the purple bands of the fore wings sometimes quite distinct, in other specimens entirely absent, replaced by the ground colour ; and in these there is little or no purple colouring upon the cilia.

Underside of the fore wings pale olive-brown shaded in the middle and along the hind margin with purple, and beyond the middle with yellow ; hind wings very similar. Body and legs olive-brown.

Variation is mainly confined to the depth of the ground colour—from yellow-brown to blackish-brown ; and to the oblique purple transverse stripes. These last, as already remarked, are sometimes entirely absent ; in other cases the inner one is partially so, its inner half alone being visible, and this sometimes brilliant and sharply defined ; in other specimens it is divided into two, so that the wing is ornamented with three parallel purple stripes, the outer very much the broader. In those instances in which the purple

is absent the usual intermediate brown stripe often becomes yellow-brown, and still serves to separate the areas of the two bands.

On the wing in May and June ; sometimes, in the extreme south, at the end of April ; occasionally individuals of a second generation appear in July.

LARVA. when full grown, an inch long. slender, uniform in width when viewed from above, but when seen sideways cylindrical in the middle segments, flatter towards the head and tail ; skin smooth ; head round, green, faintly mottled with brown ; body full velvety-green, undersurface rather paler ; lines very indistinct, but the dorsal indicated as a dark green thread bordered by paler lines, between which and the spiracles are three pale subdorsal lines ; spiracles yellowish ; beneath them is a broader pale line, which on segments ten to thirteen becomes whitish ; segmental folds yellow, usual dots very small, black, surrounded by light rings and emitting small bristles ; legs twelve, the ventral pairs being on segments nine and ten ; rudiments of another pair too small for use on the eighth. (Rev. J. Hellins.)

August and September on *Polygala vulgaris* (milk-wort). When at rest. extended straight and flat on the stem of its food ; if disturbed, it drops off and flings itself angrily about. It walks in the arched manner characteristic of a semi-looper.

PUPA cylindrical, the wing-covers of unusual proportionate length, and the general width of the body remarkably even ; eye-covers a little prominent, but with the wing and limb-covers, smooth and almost devoid of sculpture ; dorsal segments deeply divided and sharply ridged on each side with a projecting rim ; abdominal segments smooth and without pitting, but the hinder edge of each raised into a sharp rim, and the anal segment tapering very suddenly to a blunt flattened cremaster which is bent back and furnished with two very short points. In a small tough silken cocoon on the ground.

The moth is a quiet little species, loving to buzz and flit in the sunshine about open wood paths among the coarse herbage, the grassy damp spots on heaths and downs, boggy places, coast sandhills, rough meadows, and even lanes where the herbage is strong and thick. Also not absent from hill and mountain sides. It evidently flies by choice in the sunshine, and will come buzzing to one's very feet in a sheltered sunny wood-path; but seems to settle on grass and other herbage and not upon flowers. It certainly also flies at night, since it may occasionally be found attracted by a strong light. Formerly to be found close to the suburbs of London, whence it has now disappeared. Apparently distributed in suitable spots over the whole of England, and in many parts common or even plentiful; also frequent in woods and on the more sheltered parts of heaths in South Wales to Pembrokeshire. Found, sometimes commonly, in the southern portions of Scotland to Aberdeen, Moray, Perthshire, and Argyle. In Ireland common and widely distributed, plentiful in the bogs of Kerry and Galway, and to be found so far north as Slieve Donard in County Down, and Belfast. Abroad it inhabits the whole of Continental Europe, except the coldest regions, also Asia Minor, Eastern Siberia, and the mountain regions of Central Asia.

Genus 97. **ANARTA.**

Antennæ ciliated; eyes *hairy*, with short thick lashes, which sometimes are hidden among the other scales; head hairy; thorax stout, crested at both top and back; abdomen moderately stout, with erect or depressed crests; fore wings small and blunt; hind wings small, but the cell wide and the cross-bar long and angulated but weak; vein 5 very slender, arising just below the middle.

LARVÆ rather short and thick, smooth, brightly coloured; the anterior portion of the body bent under in repose. Feeding exposed.

PUPÆ in the earth in silken cocoons.

We have three species, easily recognised :

A. Hind wings yellow, with black marginal band.

B. Fore wings black-brown frosted with grey ; white central spot large. *A. cordigera*.

B². Fore wings dark crimson marbled with white ; central white spot small. *A. mytilli*.

A². Hind wings white, with black marginal band ; fore wings grey, with black marbling. *A. melanopa*.

1. **A. melanopa**, *Thunberg*.—Expanse 1 to 1½ inch. Thorax stout ; fore wings olive-grey or grey-brown, mottled and streaked with black. Hind wings white, with a broad marginal black band.

Antennæ of the male simple, rather stout, strongly ciliated, black-brown ; palpi small, coarsely and strongly tufted, yellowish-white within, black outwardly ; eyes black, thickly studded with excessively minute *white* hairs ; head loosely tufted, yellowish-white mixed with black ; thorax rather stout, dark olive-brown, with the edge of the collar, the middle and tips of the shoulder-lappets, and the tips of the long black scales white ; fascicles very long, white ; abdomen black but partially clothed with long silky white hair-scales, which give it a shaggy appearance ; lateral tufts white ; anal tuft small, greyish-black. Fore wings rather short, triangular, blunt behind ; costa very straight ; apex suddenly rounded ; hind margin gently curved and oblique ; dorsal margin straight ; colour pale grey clouded with olive-brown and dusted with black ; basal line black, ill-defined, angulated and spread into blotches ; first line also ill-defined, black, repeatedly angulated and indented ; second line hardly more distinct, composed of a full series of thickened angles and crescents and spread out upon the margins of the wing ; subterminal line obscure and much interrupted, merely the outer edge of a series of brown and black-brown clouds ; orbicular stigma a small, thickened, deep black ring ; reni-

form stigma deep black, except a grey-brown cloud in its middle; across it from the costa is a black transverse cloud or central shade, sometimes broken, but reaching the dorsal margin, and often thickened there into a broad spot; claviform stigma a small black loop attached to an angle of the first line; hind margin spotted with black; cilia dark brown dashed with white. Hind wings rounded, silvery-white in the middle; basal portion much streaked with smoky-black clouding; whole hind-marginal region occupied by a broad regular smoky-black band which often unites with a more smoky cloud along the dorsal region; the central spot rather large, crescentic, dull black; cilia white. Female very similar.

Underside of the fore wings slate-white; reniform stigma black; beyond it is a curved transverse stripe of black dusting; hind margin also dusted with black, and a similar spot lies before the apex. Hind wings white, broadly dusted from the base with black; central spot large, crescentic, black, as also is a broad hind-marginal band; cilia white. Body and legs black but shaggy, with long white hairs, except the tibiæ, which are brown, barred with yellowish-white.

There is some variation in the ground colour from greyish-white to grey-black, and in the Shetland Isles to very pale yellow. In the collection of Mr. S. J. Capper is a specimen with blacker fore wings and the blackness on the hind wings so extended as to leave only a small yellowish-white central spot preceded by a similar streak. An extremely neat and pretty dark form.

On the wing in May and the beginning of June.

LARVA of the usual *Noctua* form, tapering a little forwards from the fifth segment, and the thirteenth sloping rapidly off; the skin soft and velvety; head dark purplish-brown with darker reticulations; ground colour deep purplish-pink; dorsal line ochreous-brown, boldly outlined with black, but inter-

rupted on the fore part of each segment by a reddish-brown triangular mark ; this triangle is met on each side by a thick black wedge-shaped mark, below which again comes the continuous bright yellowish-white subdorsal line ; this line is thin on the thoracic segments, but beyond them widens in such a manner that the widest part on each segment is near the ends of the black wedges, and the whole line is finely edged with black throughout ; the sides similar to the back, but much obscured by dark red-brown freckles, and with a short blackish streak slanting downwards on each segment ; spiracles oval, black ; spiracular stripe yellowish-white, suffused beneath each spiracle with red, and delicately freckled with red along the middle ; undersurface and legs dark purplish-brown.

When young it has sixteen legs, but the first pair of prolegs is not serviceable, and that on the following segment is smaller than those on the ninth and tenth ; as it grows this pair increases to the size of the following, and before full growth that on the seventh segment has also arrived at full size. (Rev. J. Hellins.)

End of June and July on *Vaccinium vitis-idaea*, *V. myrtillus*, *Arbutus ura-ursi*, and in captivity on *A. unedo*, *Salix caprea*, *S. acuminata*, *Polygonum aviculare*, *Luzula pilosa*, the blossoms of *Helianthemum vulgare*, and probably many other low-growing plants ; feeding at night, hiding by day underneath the leaves of the food-plants.

PUPA glossy black, the segmental divisions at first reddish ; figure smooth and rounded ; the abdomen tapering off rather quickly and ending in a blunt spike. (Hellins.)

Having no personal acquaintance with this moth when alive, I cannot do better than quote Mrs. Fraser's interesting remarks in the "Entomologists' Monthly Magazine" : "This pretty little moth abounds on the tops of many of the Scottish mountains. In Perthshire I have found it on every Ben which I have ascended to the height of two thousand feet and

upwards during May and early June. It is not among the lonely mountain wild flowers, nor yet on the heather, that it is found, but when the altitude is reached where the heather grows thin and sparse, and the grey lichen takes its place as a covering to the surface, then *Anarta melanopa* may be seen flying rapidly in the sunshine, or even on sunless days if the air be mild. On at least two mountain-tops, where it exists in large numbers, the rocks are of a peculiar grey colour, which matches perfectly with the upper wings of the insect; and in those two localities I observed that it almost invariably alighted on the rock, and was then all but invisible. Very rarely did it rest on the lichen, and although the resemblance in colour of the moth to the grey lichen was very great, it was not so perfect as the resemblance between the moth and the rocks, the latter thus affording a more perfect concealment when at rest. In other localities, where the rocks are of a colour unlike the upper wings of *melanopa*, it invariably, as far as I could see, settled on the lichen-covered ground, and I did not see a single specimen alight on a stone or rock."

"The absence or presence of fringe-moss" (*Grimmia hypnoides*, Braithwaite = *Trichostomum lanuginosum*, Hedwig) "on the top of a hill is an interesting point. I know many hill-tops up to the height of three or four thousand feet clothed with short dry grass, but without fringe-moss; on those hills I never saw *melanopa*. On those whose summits above two thousand feet are clothed wholly or partially with fringe-moss I have invariably found it in greater or less numbers; yet this is not its food! I believe that the larvæ require the moss to hide in, and that if found on the grass-covered hills the birds would clear them off. The moth is almost as invisible when at rest on this moss as on the lichen."

"I have never observed it in any locality lower down than where lichen begins to take the place of other plants, and on a mountain-side in May or early June, with a hot sun and a

cool fresh wind blowing over the snowy peaks, it is a glad-some sight to see these pretty moths, which with the ptarmigan, the dotterel, and the mountain-hare, are almost the only living things to be seen."

When the weather is very rough, however, it shelters itself among heather, and may be shaken out, and so secured. So far as I know, it flies only in the daytime.

Besides Schiehallion and the other high hills of Perthshire, it is found in the mountains of Aberdeenshire, the Clyde district, and Sutherlandshire; also in the Hebrides, and abundantly in the Shetland Isles; but, so far as is known, not in England, Wales, or Ireland. Abroad its range seems to be very limited—the Alps, Lapland, and Labrador.

2. **A. cordigera**, *Thunberg*.—Expanse 1 to $1\frac{1}{8}$ inch. Thorax stout and hairy; fore wings black, shaded toward the base and hind margin with silvery-grey; reniform stigma large, white. Hind wings bright yellow, with a broad, deep black marginal band.

Antennæ of the male simple, minutely ciliated, black; palpi short, strongly and coarsely tufted, black; eyes brown; head moderately tufted, black; thorax very rough with long raised scales, black except the back of the collar and the edges of the central portion, which are faintly white, and the tips of the flattened crest at the back more distinctly so; fascicles dark smoke-colour; abdomen silky black with a pile of long black hair-scales; lateral and anal tufts broad. Fore wings of moderate breadth, rather pointed, costa only curved in the smallest degree; apex bluntly angulated; hind margin almost straight to below the middle, thence a little rounded off and very faintly crenulated; dorsal margin straight; colour black or brown-black, the basal and hinder regions more grey from superimposed white scales; basal line indicated by obscure deep black spots; first line erect, indented, black, the space between it and the basal line frosted with white scales, especially so at its border; second line rather

erect but strongly curved above the middle and regularly scalloped or indented, black, thrown up by an outside edging of white scales, which is more distinct upon the costa; the region behind this is regularly dusted or frosted with white scales, a triangular space before the apex being less so; there is little trace of a subterminal line, unless it may be said to be sometimes indicated by a few blacker dots; orbicular stigma barely visible as a blacker ring; reniform stigma very large, rugged in its outline, pure white, but with an ill-defined black streak in its inner side; claviform stigma just visible as a black loop; cilia brown-black spotted with dusky-white. Hind wings short, with the hind margin faintly sinuous; bright yellow, with a broad smoky-black stripe on the costal margin which merges at the apex in a blacker broad hind-marginal band; cilia white but blackened along the base. Female similar, but having the central black band even broader, and less defined by white dusting, or sometimes quite devoid of the frosting of white scales.

Underside of the fore wings smoky-black with a large central pale yellow blotch; hind wings exactly as on the upper side. Body and legs black-brown.

Usually quite constant in colour and markings, but in the collection of Mr. W. H. B. Fletcher is a specimen in which the white spot of the fore wings is enlarged and spread over the central band.

On the wing in May.

LARVA slender, all the ventral prolegs of about the same size, head hard and shining, dark purplish-brown with a blackish blotch on the corner of each lobe; general surface soft and velvety, crimson-brown; dorsal line white; sub-dorsal line similar but faint, spiracular stripe brownish-ochreous freckled with crimson-brown; undersurface and legs dark purplish-brown. At full growth another variety is almost black with only a trace on the end of each segment of the dorsal and subdorsal lines, but the spiracular stripe

brown tinged with deep lurid red ; undersurface sooty-brown. When very young, dull pale purple with black raised dots, and the head, collar, and anal plate shining black ; the two anterior pairs of prolegs then small and not serviceable. At three weeks old these legs, though still small, have come into use, and the adult colouring is being gradually assumed. (Rev. J. Hellins.)

June and July ; on *Arbutus ura-ursi* (bearberry), *A. unedo* (in confinement), and *Vaccinium uliginosum* ; feeding at night and hiding by day underneath the leaves.

PUPA apparently undescribed ; in a rounded earthen cocoon.

The moth flies swiftly in sunshine, and at that time is difficult of capture. In cloudy weather it sits upon the rocks on the moors and mountain-sides, or on the ground among moss or lichen, which it closely resembles, and generally agrees with the last species in habits, while frequenting spots lower down upon the hills. It is also much less plentiful and more attached to restricted localities. So far as these Islands are concerned, confined to the mountains of Perthshire, Aberdeenshire, and elsewhere in the districts of the Tay, Dee, and Moray. Abroad, in the Alps, and elsewhere in Central and Northern Europe, but usually on mountains, also in the Ural Mountain district, Russia ; and in Labrador and elsewhere in the northern regions of North America.

3. **A. myrtilli**, L.—Expanse 1 inch. Body rather stout ; fore wings rich purplish-crimson or red-brown, streaked with black and white, and having a central white spot. Hind wings deep yellow with a broad black margin.

Antennæ of the male rather thick, simple, black-brown, with minute white ciliæ ; palpi short, roughly tufted, black at the sides, otherwise yellowish-brown ; eyes deep brown ; head well tufted, rich purple-red, with a white tuft at the base of each antenna : collar rich purple-red with a white

edging above and below; remainder of the thorax of the same rich red, the shoulder-lappets spotted and edged with white, and a small tuft or crest at the back barred and tipped with the same; fascicles dusky pale yellow; abdomen short and rather thick, dull black with a white edging to each segment, and the sides, especially the lateral tufts, tinged with yellow; anal tuft black, with similar sides and edging; dorsal region furnished with a series of minute raised black tufts, the anterior a little larger and tipped with chestnut. Fore wings rather narrow, costa straight; apex bluntly angulated; hind margin gently curved, especially so toward the anal angle; dorsal margin straight; colour brilliant purplish-crimson, or red-brown, marbled with white; two white dots at the base are followed by spots and clouds of pale yellow and white, which enclose a basal line of the ground colour; first line white, angulated, spread out on the costa; second line much angulated but ill defined, formed of a dusting of pale yellow changing to white at the wing-margins; subterminal line conspicuous, white, broad and much angulated; orbicular stigma indicated by a round yellowish dot, above which is a costal cloud of whitish dots, and below a roughly triangular conspicuous white spot, under this another, more clouded and smaller; reniform stigma obscurely outlined in dusky yellow; extreme hind margin faintly spotted with white, each spot followed by another, more distinct, in the cilia, which, the intermediate portion being dark purple-brown, become thus distinctly chequered. Hind wings small, rounded behind; middle portion rich yellow; base and costal margin bronzy-black; hinder portion of the wing filled by a broad deep black marginal band; cilia white. Female very similar.

Underside of the fore wings dull black suffused toward the apex with purple; in the middle is a dull yellow spot, and another, fainter, is placed upon the costa before the apex. Hind wings orange-yellow, with a broad stripe of rich purple dusting along the costal region and apex, which

shades off in the latter area into a black band along the hind margin. Body and legs black, abundantly covered with purple and dull yellow hair-scales; tibiae black, barred with yellow.

Locally variable; in Ireland and the West of England the colouring becomes often dark red-brown or black-brown, the white markings obscured, sometimes almost suppressed, even in some instances the white central spot being obliterated. On the other hand southern examples are often of a very light bright red.

On the wing from May, or even, occasionally, the end of April, till August, apparently the continuous emergence of a single generation.

LARVA stout, cylindrical, but sloping a little from the apex of the twelfth segment; head small, shining dull green dusted with purple; mouth darker; general colour bright green; dorsal line represented by a row of elongate yellow spots, the anterior half of each of which is paler; subdorsal line a row of similar spots slightly arched; spiracular line composed of Λ -shaped white markings, the apex uppermost; between the dorsal and subdorsal rows of spots is an additional row of whitish spots, and another above the spiracular markings; also above the legs and prolegs a line of oblique white dashes. (C. Fenn.)

End of July till October, but most plentiful in August and September, at which time it comes constantly under observation when one is searching heather-bloom for moths. On *Calluna vulgaris* (heather or ling) and sometimes on *Erica*; feeding by day as well as night, and may often be found resting on the topmost twigs of the heather. In confinement it has been induced to feed upon hawthorn leaves. There are records of the finding of the larva in April and May, but whether these have passed the winter in hybernation or form a partial second generation is not yet clearly settled.

PUPA very thick, whole surface extremely glossy; eye-covers prominent, limb-covers hardly noticeable, but with the wing-covers very smoothly rounded and hardly sculptured, except a few cross-channels down the antennæ; abdomen very regularly and sharply tapering to a fine point, and without perceptible sculpture; cremaster short and closely compressed, provided with minute curled-in bristles; colour of the front and thoracic portions dark olive, of the segments olive-red, except the anal extremity, which is dark red-brown. In a compact oval cocoon of silk thickly covered with small fragments of earth or vegetable substances. On or close under the surface of the ground, often attached to a root or a stone.

The moth is most lively in bright sunshine, and then flies over heather with such swiftness as to be difficult of capture. This is the case all day long if the sun continues out, but the most favoured time is late in the afternoon; at this time also I have known it to hover at the blossoms of *Rhododendron*, sucking the honey which is so plentifully furnished by them. In the north it has been known to frequent honeydew and even sugar. When the weather is cloudy it may sometimes be seen sitting on the tops of heather, and this also in the evening. Rarely I have known it sit—possibly just after emergence—upon a wooden fence at the edge of a piece of heathery common land.

A curious circumstance in connection with the ways of this insect is recorded by the Rev. J. Bristowe, who for many years studied the habits of Lepidoptera in various parts of Ireland, and in whose statements full dependence may be placed: “On July 7th, 1859, when walking over Croaghan Mountain, County Wicklow, I saw several specimens flying over the heath in their usual rapid manner. As I had not met with the species in Ireland before I was anxious to catch some specimens for my collection, but after an hour spent in trying to secure them as they flew past I

began to despair of capturing any but a very much battered specimen which I had caught at first. One would appear coming straight for me, and when I was all alive to get a stroke as it passed, off it would whisk out of reach of the net. When nearly worn out, and thoroughly disgusted with both the moths and myself, I observed one stop and buzz over a piece of heather, and as I was gently stealing up to it another joined it and commenced to hover over the same piece. Here, I thought, is some attraction, and the best thing that I can do is to take my stand near that piece of heath. Having done so I in a very short time captured as many specimens as I wished without any difficulty, sometimes catching two in my net at once. Every specimen that passed on the lee-side came to investigate this piece, when they were easily taken as they hovered over it. I thought that the object of attraction must be a virgin female concealed among the herbage, but could find nothing when I examined the spot; and in order to find out what could entice them to this place I stood quiet and left several specimens to pursue their investigations unmolested while I watched their movements. Some of them contented themselves with a very cursory examination, but others were more particular: they alighted upon the heath and crept to what appeared to be a bit of dried stick, and having walked round it and examined it on all sides off they also flew. Having fully satisfied myself that this apparent bit of stick was the source of attraction, I examined it and found that it was the dead body of a moth, devoid of wings and legs, so that it was impossible to say what species it had been, but from its size most likely *A. myrtilli*. From its bleached and dried appearance it must have been dead some time, yet this dry carcase enabled me to catch as many of this lively little species as my boxes would contain, in a very few minutes."

On open heaths, moors, or mosses throughout the United Kingdom, except perhaps the Shetland Isles, and in very many districts in plenty. Abroad it seems to occur through-

out Central Europe, Spain, Italy, and all Northern Europe except the coldest districts; but beyond Europe I find no records.

Genus 98. **CATEPHIA.**

Antennæ of the male simple, cylindrical, naked; palpi short, horizontal; eyes densely hairy and with thick back lashes; head rough, densely tufted; thorax furnished with two widely separated and rather erect back tufts; abdomen crested on five or six segments, the crests on the third and fourth the largest; fore wings thick in texture, broad and ample; hind wings having vein 5 arising near to vein 4 on the slope of the angulated cross-bar.

We have only one species.

1. **C. alchymista**, *Schiff.*—Expanse $1\frac{1}{2}$ to $1\frac{3}{4}$ inch. Robust; fore wings broad, black-brown, banded and marbled with dull black; subterminal line slender, yellow-brown. Hind wings white from the base to the middle, thence black, but with a partial white edging.

Antennæ of the male simple, cylindrical, naked, black-brown; palpi very short, densely tufted, pale brown shaded outside with black; eyes black, densely covered with short fine hair-points; head tufted, pale brown dusted with black; thorax black-brown, blackest in front, otherwise with a few scattered white scales, two similar tufts at the back form a crest; fascicles smoky-brown; abdomen of the same colour with abundant long black hair-scales. dorsal ridge ornamented with five or six black crests, of which those on the third and fourth segments are the largest; lateral tufts inconspicuous and anal tuft narrow. Fore wings rather broad; costa somewhat arched, more so toward the apex, which is bluntly rounded; hind margin also rounded, crenulated; dorsal margin gently and gracefully curved; colour dark umbreous with a bronzy tint, abundantly clouded with dull black; basal line an obscure, broken, short black streak, edged

outwardly with a shade of brown; first line not far beyond, erect, angulated, broken, and obscure, deep black edged inwardly with brown; a short distance further is a similar erect line of small deep black clouds; second line also deep black, erect to the middle, thence thrown abruptly outwards into two large lobes, but returning to a black costal spot which is edged outwardly by a pale brown or whitish dot; subterminal line represented by a series of broad bronzy-brown clouds, broadest toward the anal angle and edged with black clouds; orbicular stigma perhaps indicated by a round black cloudy spot in the supplemental first line; reniform stigma very obscure, placed in the mouths of the two lobes of the second line, obscurely bronzy-brown bordered with black; costa toward the apex minutely dotted with white; extreme hind margin edged with deep black crescents; cilia dull black faintly dusted with white. Hind wings rather narrow, rounded; basal portion nearly to the middle white; beyond this the whole wide hind-marginal space is filled with a broad smoky-black band, except that two irregular white dashes lie along the extreme margin and affect the adjoining cilia, the rest being black-brown. Female very similar, except that the fore wings are a little longer and the subterminal line sometimes much more conspicuous, forming an irregular whitish-brown stripe.

Underside of the fore wings smoky-black, with a looped black line adjoining the reniform stigma, and a stripe of white clouding along the hind margin, whiter toward the anal angle; cilia spotted with white. Hind wings white in the basal half, but broadly dusted with brown along the costal region; central spot black; beyond it is a similar slender transverse stripe; beyond this the hinder half of the wings is clouded with smoky-black, but divided by a much indented blacker line; outside this are some dusky-white clouds running into the hind margin, where is a much larger one; cilia blotched and spotted with white. Body and legs dark smoky-brown.

On the wing in June and July, but has also been taken in September.

LARVA paler or darker grey, or reddish-grey, besprinkled with numerous black dots; on the back of every segment four large, and on the sides six small, yellow raised dots; on the fourth and eleventh segments are two dark pointed elevations with paler tips; on the fourth, seventh, eighth, and eleventh segments on the sides are whitish or reddish obscure pointed dots; behind the head is a black dotted yellow collar (dorsal plate); head rounded, grey with small pale angulated markings. (Hofmann.)

July and August on oak, frequenting oak-bushes.

PUPA brown, with a bluish powdering; in a light cocoon.

This fine insect is one of our most excessively rare species, and in all probability only occurs with us as a casual migrant. There seems little reason to doubt that the present is the species noticed by Haworth under the name of *leucomelas*, whereof he says: "Mr. Francillon possesses an English specimen, and my respected tutor in Entomology, Mr. Jones, assures me that he has seen it in the British collection of that great patroness of Natural History, the late Duchess of Portland." The genuine *leucomelas* is a smaller species, extremely similar, but having its eyes *naked*. Its far more southern distribution renders its capture here very improbable. Stephens's notice of Francillon's specimen, which passed into the cabinet of Mr. Haworth, seems to support my view, since he gives its expanse of wings as one inch nine lines, which is far too large for *Anophia leucomelas*, while it agrees with that of the present insect. The point, however, is not of great importance. The first intimation of its presence in these Islands in comparatively recent times is that of the capture of a specimen at sugar on an oak-tree in September 1858, in the Isle of Wight, by Dr. A. Wallace. This fine example passed into Mr. Bond's collection, and is now in that

of Mr. Sydney Webb. It is figured in the frontispiece of the *Entomologists' Annual* for 1860. The next British specimen of which there is any certainty was a fine female taken at sugar on June 4th, 1875, in an oak wood near Horsham, Sussex, by Mr. W. Borrer, of Hurstpierpoint, in whose cabinet it still finds a place, though now in my hands for the purposes of this work. In the same year a specimen was found on June 9th sitting upon an oak-trunk near Colchester, Essex, and was recorded by Mr. W. H. Harwood, from whose possession it passed into the collection of Dr. F. D. Wheeler. The fourth was recorded in 1882 by Mr. Sydney Webb, who found it in the possession of a working collector, quite fresh, captured by him near Dover on the previous evening. The last capture of which I have any reliable knowledge was of a specimen taken at sugar at 9.30 P.M. on June 24th, 1888, at St. Leonards, Sussex, by the eldest son of my colleague upon the *Entomologists' Monthly Magazine*, Mr. Edward Saunders.

The captures in these Islands appear, therefore, to be limited as yet to Hants, Kent, Sussex, and Essex. Abroad it has a considerable range through France, Belgium, Germany, Switzerland, Hungary, Galicia, Corsica, Sardinia, Northern Italy, Southern Spain, Greece, and Southern Russia.

Family 3. **SARROTHRIPIDÆ.**

Moths of small or moderate size; the fore wings with the costa and inner (dorsal) margin arched near the base, then of nearly even width throughout, and almost always with raised buttons of scales in the cell or raised lines upon the wings; veins 3 and 4 of the hind wings united. The palpi either porrect and rostriform or upturned; legs with the tarsal joints short.

LARVÆ with four pairs of abdominal prolegs, sparsely clothed with hair in the known species.

Genus 1. **SARROTHRIPA.**

Palpi long, obliquely porrected and thickly scaled; eyes naked; antennæ minutely ciliated in the male; fore wings long, costa arched at the base, the apex bent down; hind wings broad, vein 3 branching from vein 4 very near the hind margin; a very broad space between veins 1 and 2.

We have only one species.

1. **S. revayana**, *Tr.*; **undulana**, *Staud. Cat.*—Expanse $\frac{7}{8}$ inch. Palpi porrected; fore wings tortriciform, shouldered at the base, oblong, truncate, some shade of greenish-grey or grey, olive-brown or brown; faint ridges of raised scales on the transverse lines, and a more noticeable central raised spot. Hind wings shining grey.

Antennæ of the male slender, simple, minutely ciliated, black-brown; palpi long, horizontal, the apical joint almost sickle-shaped, porrected and conspicuous, tufted and fringed below with long scales, brown; eyes naked, brown; thorax slender, smooth, greenish-grey or olive-brown, the scales lying rather closely appressed, but gathered into a small crest at the back; fascicles white; abdomen rather slender, flattened and very smooth, shining silvery-grey without hair-scales, crests, or lateral tufts; anal tuft small. Fore wings oblong, of even width, pointed and truncate; costa strongly arched at the base, and thence thickly and stiffly ciliated, almost hollowed in the middle, and straight to the apex which is angulated and a little bent down; hind margin perpendicular or even filled out, a little rounded off below the middle; dorsal margin straight to near the base, where it is rather arched; colour most frequently silvery greenish-grey; basal line angulated and abbreviated but very faint, purplish-brown; a little beyond it is a still fainter, almost parallel, similar line; usual first line near the middle of the wing, perpendicular, double, repeatedly angulated, purple-brown; second line but a short distance beyond, waved and bent in

several curves, double, obscure, purple-brown; subterminal line an irregular series of faint grey or blackish clouds edged outside with white, one of which at the anal angle is round and conspicuous; before the first line are often two or three round black dots placed perpendicularly; the outer duplicate of this first line is thickened at its angles by *raised* black or brown scales; between this and the second line is usually a triangular purple cloud occupying the whole middle portion of the costal margin and enclosing a round spot, in the middle of the wing, of sharply raised black or brown scales, which forms almost a button-like tuft; the apex of the wing, and in some degree the hind margin, is often clouded with purple-brown, and along the extreme margin is a row of black dots; cilia of the ground colour of the wing. There is a tendency to raising of the scales on all the markings, or indeed irregularly on other portions of the fore wings, more especially noticeable in specimens in which they have not been flattened in setting. Hind wings broad and ample, the hind margin sinuous, hollowed below the apex; shining pale grey or greyish-white, sometimes rather more smoky-grey along the hind margin; cilia concolorous, but with a yellowish basal line. Female accurately similar.

Underside of the fore wings pale silvery-grey; costa whiter, but obliquely barred with grey-brown. Hind wings shining whitish-grey. Body and legs pale grey, the latter short.

Variable in an extraordinary degree; so strikingly indeed that several of its varieties were formerly described and figured as distinct species. Thus a form in which the fore wings are silvery-grey, the costal region much marbled with reddish-brown and the round spots before the first line totally absent, was named *degeneranus*; another, in which the brown clouding is more spread across the wings, but the spots still absent or obscure, was called *undulatus*; one, still more strongly banded and having one round distinct spot before the first line = *dilutus*; a more uniformly brown form, but

with a large black spot over the anal angle, seems to have been known as *ilicanus*; another, devoid of all the conspicuous round spots = *Lathamianus*; another, more brownish-grey with all the round spots distinct, *Afzelianus*; and two more, in which the usual pattern of lines, bands, and spots is quite obliterated, except a few cloudy dots near the hind margin, but in which the ground colour is chestnut-brown shading paler behind, and the substituted markings consist of black stripes longitudinally from the base down the principal nervures, are called, when the black stripe on the median reaches the subterminal line, *ramosanus*; where it extends to the hind margin, *Stonanus*. At least, this is how I, in some degree, *attempt* to understand them. The last two are branches of a very remarkable and distinct variety or race, in which the normal markings are almost obliterated and a totally different ground colour, with utterly changed markings, is substituted; but the previous forms constitute modifications only of the normal colour and markings, and these are so connected by intermediate gradations that it is far from easy to disentangle the named forms. Moreover, some of the most striking variations seem to have been disregarded. One is of an exquisite pale silvery-grey with faint purplish clouding and a central black dot; others, more of the normal colouring, have a sharp black streak down the base spreading a little on the dorsal margin; others, with ground colour yellow-brown, have the fore wings sprinkled and blotted to a greater or less extent with large black cloudy spots; in others the black has spread almost all over the fore wings, obliterating the markings; and in those with the branched black longitudinal stripes, some are of a paler chestnut clouded with black, but with the hinder area and part of the dorsal margin silvery-white. Perhaps the most lovely form that I have ever seen was one formerly in the collection of Mr. C. A. Briggs: its ground colour clear bright white, with a sharply margined central band of rich dark brown; the spots before the first line sharp and bright, and those forming the

subterminal line united into a complete stripe. But the most *notable* must be admitted to be that one—of a creamy-white ground tinged with grey, a large black-brown triangular costal blotch, and the subterminal line sharply *white*, in a brown area—in Mr. C. A. Dale's collection, which is believed by him to be the type of *Micra Haworthana*, Westwood.

On the wing from August to October and, after hybernation, in April and May.

LARVA cylindrical; head rounded, light brown; general colour green, paler or darker, with a still darker cloudy dorsal stripe and interrupted yellow spiracular lines; the incisions of the segments also yellowish, but wholly covered with long white hairs, which are difficult to see except when held up to the light.

June, July, and the beginning of August, on oak and the large-leaved sawfly (*Salix caprea*), feeding upon the leaves.

PUPA cylindrical, bright green with a broad black line down the middle of the back. Not more fully described. In a white, somewhat boat-shaped, silken cocoon, upon an oak-leaf, or between two leaves of oak.

The moth prefers to sit during the day squeezed closely to the surface of the bark of a trunk or branch of oak, especially selecting those upon which lichens are growing. Its colour blends with these, and this, with its marbled markings and the roughness of its raised scales, renders it practically invisible, or rather, indistinguishable, so that when its wings are lifted by a puff of breath the discovery is almost startling. At dusk and during the darkness of night it flies very quietly, and visits any available sweets, such as heather-bloom, ivy-bloom, blackberries when very ripe, yew-berries, and even sugar. At light it is rarely taken, but this may arise from its close seclusion among its favourite oaks. Probably to be found in oak woods of any size in almost every part of the country, but records are rather scanty. This may arise in part from

its obscure habits, but far more from its being disregarded in consequence of its close resemblance in shape to some of the *Tortrices*. It is very common in the New Forest, Hants, and was formerly so in Woolmer Forest in the same county; is also to be found in woods in Kent, Sussex, Dorset, Surrey, Berks, Essex, Cambs, Hunts, Oxfordshire, Gloucestershire, and Somerset; more commonly in Devon, less so in Herefordshire; very scarce in Norfolk and Suffolk; and rare in Cheshire, Lancashire, Yorkshire, Westmoreland, and Cumberland. It has been taken in North Wales, and, since I have myself found it in Pembrokeshire, there seems little doubt that it is widely distributed in the Principality. In Scotland it is scarce, but has been found in Aberdeenshire, Kincardineshire, Perthshire, Stirlingshire, Argyle, and Moray. In Ireland in Kerry, Galway, Westmeath, Limerick, and Tyrone. Abroad in most parts of Central and Southern Europe, the southern portions of Sweden and Norway, Finland, and Livonia; also in Asia Minor, Syria, Tartary, and the mountain regions of Central Asia. In India there are forms which have received the names of *Sabrita metaspilella* and *S. latifasciella* which do not seem to be separable from the present; and the same may be said of those which have been named *Tortrix frigidana* and *T. scriptana*, from the United States of America.

This species, from its somewhat bell-shaped appearance when the wings are closed—arising from the arching of the base of the costa—and also from the existence of raised scales on the surface of its fore wings, as in the *Peronæ*, was long associated with the *Tortrices*, and even by Mr. Stainton was placed in the first family of that group. In more modern arrangements its essential distinction from that family has been recognised, and it has been placed among the *Bombycina*, with which, notwithstanding, it has but little in common. In the course of his investigations through the very large amount of material in the National Collection at South Kensington, in preparation for his valuable work on the

moths of India, Sir George Hampson arrived at the conclusion, which I think a correct one, that the genus *Sarrothripa* is intimately connected with a considerable assemblage of species of *Noctuidæ*, which are distinguished by having groups or lines of raised scales on their fore wings—*Triorbis*, *Plothcia*, *Hyblæa*, *Labanda*, *Argyrothripa*, and others—and that its proper position is in that great group.

Further study of species recently received, some of them from South and East Africa, evidently allied to *Earias* and *Halias*—genera of which we possess three species which also were formerly placed, with *Sarrothripa*, in close proximity to the *Tortrices*, and more recently among the *Bombycina*—has, I believe, convinced the same author that the affinities of these also are more closely with the *Noctuidæ*, and that he may find it necessary to place the whole family *Nycteolidae* of his work—to which *Halias* and *Earias* belong—near to the *Sarrothripinæ*, and that they must be removed from among the *Arctiidae* as at present placed by him. In this also, after seeing the allied forms, I am disposed to concur, and to indicate *this* position, as more suitable for those three species in the family *Chlœphoridæ*, than where I have placed them (in Vol. II. pages 174 to 182) in this work.

Family 4. GONOPTERIDÆ.

Palpi with the second joint straight; abdomen longer than the hind wings, stout, smoothly scaled; fore wings increasing in width to the outer margin; vein 5 of the hind wings fully and strongly developed, yet arising from the cross-bar near to vein 1.

Genus 1. GONOPTERA.

Antennæ sometimes pectinated, almost naked; palpi short, porrected; eyes naked; front lashes dense, curled over; back

lashes small; on the head is a conical tuft; thorax with the collar peaked, but without crests; abdomen rather flattened, smooth, but with two minute dorsal crests. Fore wings broad behind and the hind margin produced into projecting points; hind wings broad, vein 3 crossing vein 4 to unite on the cross-bar with vein 5.

We have but one species.

1. **G. libatrix**, L.—Expanse $1\frac{5}{8}$ to $1\frac{7}{8}$ inch. Thorax peaked, brick-red; fore wings broad, many-pointed behind, pale purple-grey blotched with orange-red, and slenderly barred with white. Hind wings smoky-brown.

Antennæ of the male pectinated with short oblique solid teeth, minutely ciliated, pale brown, darker at the base; palpi rather small, narrowly tufted, porrected, purplish-brown; eyes black, but having a superficial coating of rusty-red; head tufted with a prominent ridge, narrow at its apex, pale purplish-brown, with the back rust-red; around the base of each antenna is a ring of thick erect pure white scales; collar large, upraised and peaked, even pushed forward in the middle, orange-red, edged below and at the back with pale purple-brown; shoulder-lappets orange-red shading off to pale purple-brown at the back and below; remainder of the thorax of the same purplish-brown shade, the back scales drawn together into a divided tuft, fascicles pale purplish-drab; abdomen broad, smooth, flattened a little, pale rusty-brown, toward the base more tinged with purple; on the dorsal ridge of the basal segments are two very small oblique tufts or crests, brownish-drab; lateral tufts spreading and conspicuous; anal tuft flatly compressed. Fore wings broad, especially so behind, costa faintly arched at the base, thence straight to near the apex, which is very sharply pointed; hind margin below it deeply concave, but in the middle filled out to a squared point which extends farther than the apex; below this are three more angles divided by deep hollows, the third being the anal angle; dorsal

margin expanded and decidedly curved; colour pale purple-brown dusted with dark brown and richly clouded with orange-red; in the middle of the base is a round white dot of thickened upraised scales very sharply defined and like a waxen drop on the surface; basal line not indicated; first line nearly erect, twice curved, dusky-white edged on each side with purplish-brown; second line dull white, double, rather oblique and direct, but a little curved in the middle, and when close to the costa throwing back a white dash at a sharp angle to join a white costal dot; subterminal line just visible as a meandering irregular whitish shade; orbicular stigma represented by a pure white dot upraised and very similar to that at the base of the wing; reniform by two perpendicularly placed black dots; from the base to the second line the surface, and more especially the middle portion, is much suffused with large clouds of rich orange-red, and a similar straight oblique dash lies at the base of the dorsal margin; cilia dull chocolate-brown shaded with dark brown. Hind wings large, broad, but rather short; hind margin minutely crenulated, smoky purplish-brown, a shade paler toward the base; cilia concolorous. Female extremely similar.

Underside of the fore wings dull purple-brown dusted with dark brown and clouded in the middle and along the nervures with smoke-colour; from a black costal spot arises a similar oblique transverse line; costa otherwise regularly barred with black-brown; dorsal margin iridescent yellowish-white. Hind wings purple-brown much dusted with black-brown; a smoky-black partial central transverse stripe is followed by a similar cloud toward the apex. Body and legs purple-brown; tibiae barred with white.

Hardly variable, or only so in the general tone of colour, darker or paler; and in some degree in the extent of orange-red clouding.

On the wing from August till October and, after hibernation, till May.

LARVA with sixteen legs, the prolegs complete; head rounded, pale green; body elongated, rather even in thickness, but the segments slightly rounded up, extremities very little tapering; colour soft semi-transparent grass-green, the usual lines scarcely visible, or sometimes the spiracular more yellow-green; spiracles reddish-black; legs and prolegs green. When young the dorsal and subdorsal lines show rather darker green. When quite full-grown, and about to pupate, a large jet-black spot appears on each side of the second and third segments, at the insertion of the future wings, but these spots are thrown off with the larva skin.

May to July or August on willow, poplar, and poplar; feeding mainly at night, but remaining upon leaves of its food-plant during the day, and wonderfully protected by its soft similar semi-transparent green colour. Its work, however, is conspicuous enough, and the considerably eaten leaves of a strong willow shoot by the wayside readily lead to the discovery of the culprit; its ravages in osier-beds are sometimes rather serious.

PUPA nearly of the ordinary *Noctua* form, but rather more pointed than usual at the head, and with the hinder portions of the wing-covers swollen; these covers, and those of the limbs and antennæ, are dull with excessively minute and close roughening, which can hardly be called sculpture, but their margins rather more glossy; dorsal and abdominal segments covered with the same dull downy appearance, and the edges without pitting or other sculpture but *bevelled* off behind; cremaster short and blunt, but furnished with a cluster of spreading hooked spikes or bristles. Colour usually dull black, but sometimes dull chestnut-brown, in which case the incisions of the abdominal segments are darker and the spiracles nearly black. In a slightly-built silken chamber among dead leaves on the ground.

The moth doubtless hides among dead leaves on the ground during the day so long as it remains at large; and

Professor Poulton states that it is particularly attractive to birds, and points out that its shape when at rest, and colour, harmonise in a wonderful manner with faded fallen leaves, even to the extent of its having upon its wings what appear like small dots of white fungus. At night, during the autumn, it will come freely to sugar daubed upon trees, also to ivy-bloom and even ripe blackberries; and in spring occasionally to willow-bloom, though much more readily to sugar. Its flight is soft and gentle, but it is rarely captured on the wing. I have found it at night in late summer sitting upon leaves of reed, in great masses of this plant in the fens, with other *Noctua*, but the object of these assemblages never transpired. It has the curious habit of passing the winter, if possible, in buildings, or, at any rate, under masonry; and there is a record of the finding of eight individuals sitting quietly for hibernation on the inside of a church bell, undisturbed by its frequent ringing! The more usual resort, however, is the roof of an archway or cellar, or of some outbuilding or disused store, always, or nearly always, preferring the ceiling or roof. I had once (in 1865) an excellent opportunity of observing the hibernation of this insect, along with *Vanessa urticae* and other species. The retreat was eminently suitable, a weather-proof and ceiled building without windows, and the shutters not too closely applied to the window-frames. Here, on August 21st, the first *G. libatrix* took up its station; within the following fortnight four more had settled down, and one of them had actually stationed itself upon the side of the wings and body of a similarly hibernating *Vanessa* in such a manner that the deeply indented hind margin of the moth showed itself beyond that of the butterfly, giving the latter a very odd appearance. This individual in a few days moved back to the ceiling, and was joined by others, so that I found early in October twenty-seven individuals of the present species in that building, the weather up to this time having been quite exceptionally hot and sunny. Indeed, this was the finest

and hottest autumn that I have known (previous to that of 1898), and the blackberries, in an unusual condition of richness and sweetness, afforded every night a banquet to myriads of moths, including those of the present species which had not settled down for hybernation. To make quite sure that the moths in the building were actually established for the winter, and not merely hiding in the daytime, I examined the premises at night with a lantern and found all quiescent. Those which had found a crevice or break in the plaster into which they could poke their heads had not moved at all, and the rest only changed their positions very slightly, sometimes to push their heads for shelter under a neighbour's wing. These, with a few more which came in gradually in the later autumn, continued in this state until the spring. It has been definitely ascertained that pairing takes place after hybernation, the eggs being laid in the spring. Found throughout England, Wales, and Ireland, and in most parts commonly; also in Scotland, in the east to Kincardineshire and Aberdeenshire, and even, very rarely, in Moray; in the west commonly to Clydesdale, and in Argyleshire; there is also a record of its occurrence in Shetland. Abroad its range is very wide, over Central Europe, the temperate portions of Northern Europe, Italy, Corsica, the Balkan States, Southern Russia, Armenia, Asia Minor, Tartary, the mountain regions of Central Asia, Japan, Canada, and the United States throughout to California.

Family 5. **QUADRIFIDÆ.**

Fore wings broad, frequently very so; hind wings but very slightly folded longitudinally, vein 5 strong and complete, joined or very nearly joined to vein 4, producing the same fulness on the hind margin as the other nervures.

Genus 1. **OPHIODES.**

Antennæ cylindrical, naked; palpi short, pointed forward; eyes naked, without lashes; head with an angulated or

pointed tuft in front and a cross-ridge above it; thorax with a ridge down the middle of the back; abdomen round, smooth, and devoid of crests; fore wings broad, thick, crenulated behind; hind wings broad; cross-bar angulated; vein 5 arising upon it close to vein 4.

We have but one species.

1. **O. lunaris**, *Schiff.*—Expanse $2\frac{1}{4}$ to $2\frac{1}{2}$ inches. Very robust; thorax ridged on the back; fore wings thick, ashy-brown, darker behind; first and second lines distinct and direct; reniform stigma black-brown. Hind wings pale smoky-brown to the middle, darker beyond.

Antennæ of the male rather stout, simple, cylindrical, hardly ciliated, light brown, the back portion toward the base white; palpi stout, oblique, covered with closely appressed scales, brown; apical joint long and pointed; head smoothly tufted, olive-brown, with an angulated white line across the face; thorax stout, almost massive, thickly and smoothly covered with scales, but with a sharply raised ridge-like edge down the middle of the back, olive-brown; fascicles brownish-yellow; abdomen silky, pale yellow-brown, stout, and rather conical; lateral tufts rather small; anal tuft compressed and pointed. Fore wings broad and ample; costa gently arched; apex angulated; hind margin strongly crenulated, gently rounded, and but little oblique, more so toward the anal angle; dorsal margin nearly straight; colour brownish-drab or ashy-brown to the second line, beyond this umbreous; close to the base is a small black spot; first line nearly perpendicular, very even and direct, brownish-white, edged on each side with dark brown, and again in the dorsal portion with smoky-brown; second line rather erect but gently curved, placed far from the hind margin, brownish-white faintly edged inside with umbreous, very strongly so outside, and clouded with black toward the costal and dorsal margins; subterminal line excessively angulated and irregular but faint, placed in the middle

of the broad dark hind-marginal area, dark brown edged inside with paler; orbicular stigma only suggested by a black-brown dot; reniform stigma conspicuous but rather small, black-brown with a blacker margin; before the extreme hind margin is a faint row of black dots; cilia long and dense, dark brown. Hind wings large, rounded, but crenulated behind; light reddish-brown to the middle, but with the costal edge pearly greenish-white; beyond the middle smoky-brown with a gloss of red-brown along the hind margin; cilia dull umbreous, paler at the tips. Female a little smaller, with rather narrower fore wings, sometimes more suffused with reddish-umbreous.

Underside of the fore wings silky pale purplish-brown, with the dorsal margin lustrous white, reniform stigma lunate, black; hind wings of the same colour as the fore but dusted with brown, and with a lunate black central spot placed unusually near to the base. Body and legs dull pale brown.

Apparently not variable in any important degree.

On the wing in May and June.

LARVA much elongated, stout in the middle; head broad, brownish-red; body yellow-brown, abundantly covered with slender longitudinal lines of red-brown atoms and dots; no dorsal line; subdorsal lines indistinct, interrupted at each segment except from the seventh to the ninth; but on the fourth replaced by a somewhat squared yellowish-red spot, and on the following segments dotted with white; spiracular stripe more conspicuous, undulating, orange-red; at the back of the twelfth segment is a rather raised ridge on which is a cross-bar of orange-red; spiracles yellow, ringed with black; between the pairs of prolegs are large brown spots; legs and prolegs yellow-brown.

July and August on oak and poplar, feeding upon the young shoots.

PUPA black-brown; cremaster armed with six points; in a slight cocoon among moss or dead leaves. (Hofmann.)

Very little indeed is known here of the habits of this rare species. Abroad it is said to frequent dry woods and to be readily disturbed in the daytime. At night it has been taken at sugar and at light. The first specimen on record in this country seems to have been taken by Captain Chawner in the year 1832 at the lighthouse at Lowestoft, Suffolk. The next was recorded by the late Mr. E. Newman as having been taken in May 1860 at sugar at West Wickham, Kent. On June 18th, 1873, a specimen was obtained at sugar at Abbots Wood, Sussex; and on May 28th, 1875, another in the same place; one also having been taken by similar means at Brighton in June 1874. The only other British specimen of which I possess any certain knowledge was taken by Dr. F. D. Wheeler at light at Stratton Strawless Wood, Norfolk, at the end of May 1878. In Scotland Dr. White recorded the capture of an example at Perth, "evidently imported." In Ireland a specimen was taken at sugar in an oak coppice close to the Tower Lodge at Killarney, Kerry, in 1864, by the late Peter Bouchard, but Mr. E. Birchall stated that *two* were secured in this locality. In Spain Mr. J. J. Walker has found the larva commonly upon oak bushes in the *cork* woods. The range of this species is through Central and Southern Europe, Northern Africa, and Asia Minor.

Genus 2. **CATOCALA.**

Antennæ long, finely ciliated, slender; palpi short and blunt; eyes naked and without lashes; thorax broad, smooth, flatly crested at the back; abdomen very round, smooth, and tapering, with small depressed dorsal tufts. Fore wings broad, strong, and very ample; hind wings large, brilliantly coloured; vein 5 uniting with vein 4 at the cross-bar, strong and equal to the rest at the hind margin. All the wings crenulated behind.

LARVÆ elongated, flattened beneath, and there spotted

with black; rough, somewhat twig-like, and having fleshy filaments at the sides; head rather forked at the top.

PUPÆ of ordinary form, covered with a hoary powdery efflorescence, in a slight cocoon among debris.

We have five species, one being of *excessive* rarity:

A. Fore wings grey, striped and marbled with black; hind wings black with pale blue band. *C. fraxini*.

A². Fore wings smoothly grey with black lines; hind wings pinkish-crimson with black bands. *C. electa*.

A³. Fore wings brownish-grey dusted with darker; hind wings dull crimson and black; cilia broadly white.

C. nupta.

A⁴. Fore wings marbled, pale brown, black, and white; hind wings rich crimson, inner black band perpendicular and curved. *C. promissa*.

A⁵. Fore wings marbled, yellow-brown and black, with whitish central blotch; hind wings purplish-crimson, the inner black band much angulated. *C. sponso*.

1. **C. fraxini**, *L.*—Expanse $3\frac{3}{4}$ inches. Very robust; fore wings grey dusted with blue-grey, and banded with zigzag black stripes, some of them in pairs; hind wings brownish-black with a broad pale *blue* central band, and the hind margin white.

Antennæ of the male long, simple, cylindrical, ciliated in minute tufts, thickened toward the base and tapering off, black-brown; palpi short, thick, broadly tufted, grey-brown dusted with white, apical joint distinct; eyes black-brown; head tufted, black-brown dusted with white; thorax robust, grey-brown, abundantly dusted with white, black, and golden-brown; the shoulder-lappets rather more hoary-brown, banded with dull black and edged with dull white; at the back is a short broad spreading black crest edged with greyish-white; abdomen stout, round, and tapering, smoky-black with a shading of bluish-white, and the edges of the hinder

segments white ; lateral tufts small, pale grey ; anal tuft long, depressed, almost divided, pale brownish-grey, blackened in the middle. Fore wings of moderate length, broad and ample ; costa strongly arched throughout ; apex bluntly angulated ; hind margin not very oblique, but gently curved and strongly crenulated ; dorsal margin very gracefully curved ; colour pale grey or whitish-grey, broadly and abundantly rippled and dusted with blue-grey and black, and a little with golden-brown ; basal line incomplete, formed into two black curves which enclose a black blotch ; first line double, the two stripes not parallel but much angulated, dusky-black dusted with golden-brown and enclosing whitish spaces ; second line also double, more parallel, excessively angulated and indented, the inner portion black, the outer similar, except the middle portion, which is golden-brown, and the intermediate space white ; subterminal line dull black, sprinkled all over with a dotting of smoky-brown, angulated and throwing off short points throughout ; no orbicular stigma ; reniform stigma black centred and edged with grey, and outside with a partial black margin ; immediately beneath is a large creamy-white spot edged with black, like an additional stigma ; outside this and extending across the wing is a broad central band of dusting of black and golden-brown, all the transverse lines being broadly or narrowly clouded on each side with similar dusting ; along the hind margin is a row of black crescents, that which is nearest the anal angle uniting with the subterminal line ; beyond these is a faintly double blackish marginal line undulating beautifully into every crenulation ; cilia greyish-white. Hind wings broad, rounded, and very strongly crenulated behind, smoky-black in two broad bands, divided by a pale blue or slate-blue broad central space, which fades to white at the costa ; along the hind margin the hinder black band is invaded by a cloudy-white stripe, the outer portion of which is, with the cilia, bright white faintly dashed with brown streaks, and there is along the extreme margin a

series of black-brown crescents marking the crenulations; the long fine hair-scales of the dorsal margin are also white. Female rather stouter, otherwise accurately similar.

Underside of the fore wings white at the base and on the costa, toward the dorsal margin more pearly-white; beyond this is a very broad, oblique, cloudy, smoky-black band uniting upon the dorsal margin with another, much more perpendicular and deeper black, transverse band; beyond a broad white stripe is another smoky-black band which shades off gradually to a blackish dusting upon the white hind margin. This is sharply edged by a black slender undulating line which throws in points from its inner curves, and others outwards into the white cilia from the outer curves. Hind wings shining white with a large black central spot, and a transverse black curved stripe beyond it; towards the hind margin is another, broader but more smoky-black band shading off to white along the hind margin and apex; marginal line and cilia as in the fore wings. Body and legs yellowish-white, the tufts upon the femora very large; knees also tufted, pale grey in front; tibiae banded with black.

On the wing in August, September, and even October.

LARVA nearly three inches in length, slender, head broader than the second but a little narrower than the third segment, flattened in front, and slightly notched on the crown; body of fairly uniform width, but segments 7, 8, 9 and 10 the broadest, undersurface flattened; on the back of the ninth segment is a small hump, and a smaller ridge at the back of the twelfth; segments clearly defined; dorsal region smooth and without hairs, but a rather dense row of short hairs, pointing downwards, below the spiracles, divides the dorsal from the ventral area. Dorsal area putty colour with a strong greenish tinge, and freckled, particularly on the hinder part of each segment, with brown atoms; head pale pink, edged at the back with a conspicuous band of dark damson-plum colour; this band narrows off to a point on each side

of the face, the upper part of the latter being reticulated with the same colour; towards the mouth are several dark brown streaks, whilst on each mandible, and also on each side, is a dark brown spot; dorsal stripe green, very narrow; spiracles oblong-oval, black, encircled with greyish-white; the hump on the ninth segment is darker than the ground colour, the dark colour extending into a somewhat horse-shoe-shaped mark; the back of the ridge on the twelfth segment is of the same; segmental divisions pink. Ventral surface greenish-white, with a large and conspicuous dull black triangle on segments 7, 8, 9, 10, and 11; and paler, more rust-coloured marks on the centre of segments 3 and 4; legs and prolegs greenish-white, the former long and tinged on the outside with pink; the last three pairs of the latter large and spread out; hairs greyish-white.

When half-grown the head is considerably wider than any of the following segments and the colours throughout are of a darker shade. (G. T. Porritt.)

May to July on poplar—*Populus nigra*, *P. tremula*, and *P. alba*—resting at full length on the twigs or small branches, and from the form of the legs and prolegs, having a sprawling appearance.

PUPA of ordinary form, purple plum-colour, covered with a greyish-white powder like the bloom of a ripe plum. In a loose cocoon among dead leaves.

The moth usually sits during the day upon the trunk of a tree, to which its colour and markings closely assimilate it. At dusk it flies, and has been taken at sugar and other sweets, and even in bottles of such mixtures placed among fruit-trees to destroy wasps. When sipping the sugar placed upon a tree-trunk it sits with wings upraised, and must have a very fine appearance. Always a rare species, probably only occurring with us as a migrant, since there is no record, so far as I am aware, of the finding its larva in these Islands. No certain record of the earliest capture seems to exist.

The earlier writers refer to it merely as a rare species. Haworth certainly knew of several British examples. Mr. C. W. Dale has, in the collection made by his late father, a specimen captured at Doveridge, Dorset, in the year 1740. One was taken at Arundel, Sussex, in 1838, in a bottle of beer and sugar intended for the capture of wasps. In 1842 Mr. S. Stevens took one at sugar in his garden at Hammersmith. Up to 1846 three had been recorded in Lancashire; in that year one was obtained at Yarmouth, Norfolk; one at Bath, Somerset, in 1850; one at Hull, Yorkshire, in 1858; one in the Isle of Wight in 1866; others at Ipswich and Aldeburgh, Suffolk, and in Cheshire, in 1868; at Eastbourne and Brighton, Sussex, in 1869; in 1870 one at rest upon an ash-tree in Regent's Park, London, in the daytime, and another in 1872, in which year specimens were taken at Shrewsbury, at Wisbech, Norfolk, at Bourn, Lincolnshire, and three at Ipswich. For some time after this year the species seems not to have been represented, but in 1880 it was taken in Somerset; after another interval at Winchelsea, Sussex, and in Kent in 1889; in North Devon in 1895, in which year also specimens were obtained near Hastings, Sussex, and at Folkestone, Kent; at Scarborough, Yorkshire, in 1896. Probably these only represent a portion of the captures, since I see that there is one, without date, at Burton-on-Trent, Leicestershire, and that ten in all are recorded from Lancashire, four from Yorkshire, and four from Cheshire. Of the older captures, two beautiful specimens may be seen at Bethnal Green Museum in the collection of the late Mr. H. Doubleday; and three in the collection of the late Mr. F. Bond, now in the possession of Mr. Sydney Webb. On the borders of Scotland a specimen was taken in September 1876 at sugar in the Vicarage garden at Berwick-on-Tweed. Farther north, in September 1883, another at sugar on an oak at Tulyallan Woods, Culross, Fife; and in 1896 Mr. Arthur Horne obtained a specimen at Aberdeen, and saw another which had been taken in the same year *in*

the Orkneys. Respecting another specimen, taken by a working man who found it sitting in a road in the neighbourhood of Hawick, very careful inquiry has been made by Mr. W. Grant Guthrie, and there appears to be no doubt of the genuineness of the capture. These are all the Scottish specimens of which I have any knowledge; and there appears to be no record for Wales. In Ireland a specimen was captured in the year 1845 at Kingstown by the Rev. Joseph Greene; and another by Mr. D. C. Campbell at Londonderry in 1896. Abroad it is found throughout Central Europe, South Sweden, South Finland, Piedmont, Southern Russia, and Tartary.

2. **C. nupta**, *L.*—Expanse $2\frac{1}{2}$ to $3\frac{1}{4}$ inches. Large and stout, fore wings broad and ample, pale greyish-brown dusted with dark grey, and marbled with zigzag black cross-lines and shades; hind wings light scarlet-crimson, with a broad curved black central stripe, and broader black marginal band edged with white.

Antennæ of the male long, simple, minutely ciliated, brown; palpi rather short, curved up, broadly tufted, dark brown, apical joint smooth and distinct; eyes naked, prominent, mottled with greenish-brown and black; head smooth, grey-brown dusted with white; thorax grey-brown shaded with yellow-brown, the collar faintly barred with the same and with smoky-black; at the back is an obscure double crest tinged with brown; fascicles very slender, smoky-brown; abdomen smooth and tapering, pale grey-brown, each segment edged with white; lateral tufts minute; anal tuft compressed and pointed. Fore wings broad and ample; costa rather considerably arched, especially so toward the apex, which is angulated; hind margin very conspicuously crenulated, nearly straight, but curved off at the anal angle; dorsal margin faintly curved; colour grey or brownish-grey, much dusted with black and faintly shaded with yellowish-brown; basal line angulated, incomplete, dusky-black; first

line double, the outer rather thick, black-brown, the inner pale brown, both, with the pale brown enclosed stripe, rippled and angulated or placed in curves from each end, yet very direct; second line black, edged with yellow-brown, arranged in angles and long points, an especially deep inward sweep close to the dorsal margin being followed by black zigzags, and half-way to the costa by a large outward angle; sub-terminal line composed of black dusting placed in regular angles and edged inside with pale clouding; no orbicular stigma; reniform stigma very large, edged at the back with black, and having two erect parallel bars of black dusting followed by a faint similar marginal line; below it is a brownish ovate blotch of one-half the size, edged with black-brown; costa spotted at the junction of the transverse lines with dusky-black; hind margin dotted with black lunules; cilia grey-brown delicately lined with darker brown, which follows the undulations of the marginal crenulations. Hind wings large, rich red or scarlet-crimson, with long orange-red hair-scales along the dorsal area; from the costa before the middle arises a broad central black curved stripe, which tapers off toward the middle of the wing, but is there thickened by an outward extension, and bends toward the dorsal margin but does not attain it; beyond this is a very broad black band which, commencing just beyond the middle of the costa, occupies the whole hind-marginal space, but has its inner edge waved and excavated, the outer following accurately the crenulations of the margin; cilia long, clear white. Female rather stouter, but closely similar.

Underside of the fore wings smoky-black; the base, a half band from the costa and a broad sinuous complete band beyond the middle, all white; apical region thickly dusted with hoary-grey, which runs along the hind margin. Hind wings light scarlet, shading off along the costa to white, and with black bands as on the upper side; apical edge and cilia white. Body dusky-white; legs grey in front and barred with pale brown; leg-tufts brownish-white.

Usually very constant in colour and markings, but occasionally a remarkable exception is met with; one now in the collection of Dr. P. B. Mason at Burton-on-Trent is magnificent, the fore wings being suffused with bluish-slate, the hind wings almost black, the usual red areas being wholly suffused with smoky red-black, while the bands are almost blue-black. This specimen was reared by Mr. J. H. Smart, of Plumstead, Kent, from a larva found in that neighbourhood. An example in which the red colour of the hind wings was replaced by blue—as in the last species—appears to have been taken at Colchester in 1889. Another taken at Mitcham, Surrey, in 1888, by Mr. M. Winckley, has the fore wings much darkened, and the hind with the usual red colour replaced by a warm brown, the black bands shot with purple, and a purplish glow over the entire surface. Occasional specimens have the hind wings of a dull brick-red; and Mr. W. West, of Streatham, has one in which they are shot with yellow.

On the wing in August and September, occasionally till mid-October.

LARVA elongated, tapering a little to each end, flattened beneath, and having along the sides numerous bristles, which slope downwards and cause it to seem closely appressed to the surface upon which it is resting; above these is an undulating raised longitudinal ridge; segments transversely wrinkled near the incisions, and having a pair of small brown subdorsal prominences or knobs at each incision; between those, at the end of the eighth segment, is a larger broad dorsal hump. Head flattened, the face pale grey edged with black, antennal papillæ brown; sides of the head mottled with grey and brown; body pale greyish-brown, abundantly and minutely waved with dark brown, the dorsal and subdorsal stripes dark brown and undulating, but rather obscure, the brown waved clouds running into them and being studded with multitudes of minute darker dots; undersurface pale

grey, with a large black spot in the middle of each segment; legs pale brown; prolegs pale grey, the anal pair much extended, but when at rest laid closely together and slightly elevated. When quite full grown the markings become much obscured or obliterated and the colour paler. In general appearance singularly like the larvæ of some of the larger *Geometridæ*.

By careful and continued experiments on larvæ of this species from the egg to full growth Professor Poulton and Miss Lilian Gould have proved, I think conclusively, that the shades of colour, from pale grey to uniform dark brown, are controlled by their surroundings, so as to agree in the most favourable manner, for their own security, with the colour of the twigs and branches upon which they rest. Papers on this subject have been read before the Entomological Society of London.

April to July on willow, but occasionally upon poplar and plum; feeding at night; hiding in the daytime in the crevices of the bark of the tree, on which, from their wonderful assimilation in colour and structure, they are practically invisible, and are best found by the sense of touch.

In the egg state through the winter.

PUPA of the usual *Noctua* form, regularly tapering behind; the face and antenna-covers tolerably smooth, but the limb- and wing-covers closely inscribed with sculpture of incised lines, and the dorsal and abdominal segments with abundant pitting, except a smooth band at the hinder edge of each segment. All this sculpture is obscured by a thick dusting of bluish-white powder or bloom, which clings closely to it; under this the general colour is purple-brown; cremaster black, short, broad, flattened and extremely rugose, furnished with a pair of strong spines slightly hooked, and outside these with a few light brown curled bristles, with all of which it holds strongly to the silk of its cocoon. This last is open

and loose, consisting of a comparatively slight fabric of silk fastened to any surrounding dead leaves or débris, close to the surface of the ground.

The moth sits in the daytime, with its bright hind wings quite hidden by the broad fore wings, on the trunk of a tree or on a wall or fence. In colour it usually assimilates closely with the surface on which it rests, but its broadly triangular form, as it rests with head up, makes it really sufficiently conspicuous. It is, however, usually on the alert, and if disturbed flies vigorously away over houses or around trees to a more secure hiding-place, being while on the wing a gay and beautiful object. At dusk it flies voluntarily, and may be seen around willow-trees, sometimes commonly. It comes readily to sugar both at that time and late at night, also to the flowing sap of a wounded tree, and occasionally to light.

Formerly plentiful in the London suburbs and still to be found occasionally; indeed I have seen it sitting here upon the trunk of a tree in my own garden, and rather frequently on the trees in the adjacent street. Moderately common wherever willows occur throughout the Southern and Eastern Counties of England to Norfolk, and westward to Devon, but apparently rare in Somerset, Herefordshire, and Worcester-shire, and scarcely noticed north of Bucks and Hunts in the Midlands or of the counties already mentioned, save once in Yorkshire and a rather doubtful record in Berwickshire. In Ireland Mr. Kane has received only vague information of the occurrence of two specimens, one without locality, the other *seen only* in the County Louth. Abroad it has an extensive range, through Central Europe, South Sweden, Northern Italy, Livonia, the Balkan States, Southern Russia, Asia Minor, Persia, Northern India, and the mountainous regions of Central Asia.

3. *C. electa*, *Bkh.*—Expanse $2\frac{1}{2}$ to $2\frac{3}{4}$ inches. Fore wings pale grey with paler clouds and black lines. Hind wings

pinkish-crimson with two black bands, the inner shortly bent; cilia white.

Antennæ of the male long and slender, minutely ciliated, brown; palpi rather short and thick, blackish-brown tipped with white; eyes black-brown; head whitish-grey with flat protruding scales; thorax whitish-grey, dusted with darker, the collar with a broad light-brown bar across the front, the shoulder-lappets and a broad back-crest edged with black-brown; abdomen rather downy, pale grey, the dorsal crest obscure or compressed, tinged with smoky-brown; lateral tufts small; anal tuft rather long, compressed laterally, tinged with brown. Fore wings ample; costa very gently arched; apex squarely angulated; hind margin but slightly crenulated, curved and full; dorsal margin faintly hollowed; pale slate-grey with faint transverse shadings of pale brown; basal line black, incomplete, forming two bends from the costa; first line repeatedly and deeply angulated, duplicated, formed of black and brown atoms, but the costal half of the outer duplicate deep black; second line black, deeply angulated, indeed straggling into very long deep black angles above the middle; subterminal line a regularly angulated shade of very pale grey bounded inwardly by a parallel shade of light brown atoms, and outwardly by a clouding of dust of darker grey and brown, through which the nervures are blackened; reniform stigma large, defined by a regular black edging inwardly and an irregular angulated one outwardly, and containing a smaller, more distinctly black-margined, similar marking; below this is a pale spot with a slender black margin which unites with, *and opens*, one of the angles of the second line; hind margin spotted between the crenulations with small black crescents; cilia grey. Hind wings broad, rounded and crenulated; pinkish crimson, with the usual two black bands, the inner short, broad and rounded like a *head*, close to the costa, then narrowed to a thick neck, below which it leads abruptly in from a broad round shoulder, and is suddenly cut off half-way to the dorsal margin; outer

band very broad from the apex to the middle, thence tapering to the anal angle, irregular in its inner margin, but very little excavated; cilia white. Female similar.

Underside of the fore wings smoky-black with large white bars, one at the base, another part way from the costa to the dorsal margin, the third complete, though very narrow toward the dorsal margin; apical region also dusted with white. Hind wings white from the costa to near the middle, thence rosy-crimson streaked with white; black bands nearly as on the upperside, but the inner more slender. Body and legs dusky white, the fore tibiae barred with black-brown.

On the wing in August and September.

LARVA paler or darker yellow-grey or yellow-brown sprinkled with minute black dots, the raised dots on the back yellow; on the eighth segment is a lenticular elevation, bright yellow, narrowly edged with black; on the eleventh segment another elevation, doubly pointed, yellow-brown; spiracles white, ringed with black; the fringe of hairs short, whitish; head divided, rather heart-shaped, yellow with a browner edge.

May and June on willow and poplar. (Dr. Hofmann.)

PUPA brown, with a blue powdering. (Hofmann.)

This excessively rare species can hardly be regarded as other than a casual migrant with us. Two specimens only are satisfactorily known to have been taken in this country; the first at sugar on the trunk of an elm near Brighton, on the 24th September 1875, by Mr. A. C. Vine; the other in a trap set to catch and destroy wasps in a garden at Corfe Castle, Dorset, by Mr. Eustace R. Banks, on September 12th, 1892. Abroad it is found in France, Belgium, Germany, Northern Italy, Southern Russia, Armenia, and Tartary.

[*C. elocata*, *Esp.*—This, which at one time was recorded as a British species, is not to be confounded with *C. electa*.

Curtis recorded it in error, and Stephens pointed out the error and its cause. It is a fine insect, larger than *C. nupta*, and rather similar to it, but with broader fore wings, more dusted with black, and with thicker black lines, differently placed. There is no reason whatever to suppose that it has ever been found in these islands. Its range abroad is through part of Central Europe, Southern Europe, Northern Africa, Asia Minor, with Syria, Armenia, and Central Asia.]

4. **C. sponsa**, L.—Expanse $2\frac{1}{4}$ to 3 inches. Robust, fore wings ample, pale grey-brown or olive-brown with transverse black lines and bands of darker clouding, and a white or pale cloud around the stigma. Hind wings rich purplish-crimson, the central black stripe twice angulated in its upper portion and curved below; hinder black band furnished with two deep angular indentations; cilia white, spotted with black.

Antennæ of the male long and slender, faintly ciliated, black-brown; palpi small, with a minute pointed apical joint, yellowish-white with much black dusting outside; eyes black, prominent; head dark brown dusted with pale yellow; thorax black-brown, dusted and barred, especially on the collar, with golden-brown and white; back crest short and inconspicuous, but double, golden-brown tipped with black; fascicles grey-brown; abdomen smooth and tapering, dusky golden-brown, the dorsal region covered with rather long black-brown and golden-brown hair-scales in ridges across the segments, the middle portion sometimes being elevated in minute crests; lateral tufts hardly perceptible; anal tuft compressed and almost pointed. Fore wings elongated and of moderate breadth; costa gently arched; apex bluntly angulated; hind margin strongly crenulated and faintly curved; dorsal margin rather full and tufted along its edge with raised scales; colour grey-brown, olive-brown, or yellow-brown, much clouded by a dusting of black and black-brown; basal line short, straight, but toothed, black, edged outwardly

with white; first line obscure, zigzag, double, black, but so broadly shaded with velvety black dusting as to be much concealed; on the dorsal margin it encloses a white or yellow spot; second line deep black, duplicated, much indented, and throwing back a strong angle above the middle; subterminal line deep black, sharply indented throughout, and edged inside by a similarly indented pale yellow or ashy-white line; nervures, especially beyond the middle, distinctly blackened; reniform stigma placed back almost into the ordinary position of the orbicular, white or pale yellow, edged with black, and containing portions of a black indented ring; before it, in the discal cell, is a white or yellow blotch, and beneath it a large similar spot, edged with black and rather pointed; between the first and second lines the costal region is usually tinged with yellow or ashy-white, as also is the dorsal margin, and through both passes an oblique bent angulated central narrow bluish shade; along the hind margin a row of yellow dots is backed by black lunules; cilia yellow-brown at the base, white at the edge, and the colours divided by an undulating black-brown line. Hind wings broad; rich purplish-crimson, the long hair-scales toward the dorsal margin also tinged with purple; costa black; from it arises a broad black central stripe, three times strongly angled and then curved toward the dorsal margin, which it nearly attains; beyond it is a broad black hind-marginal band, its inner edge excavated into two angular hollows which lie opposite the outer angles of the inner band; cilia deeply crenulated, white shaded with smoky-black. Female very similar, but stouter.

Underside of the fore wings velvety-black, greyer at the base and apex; before the middle is a partial yellowish-white or reddish-white transverse stripe; beyond the middle a nearly complete white one; cilia white. Hind wings rich crimson, the costal region ashy-grey; central spot large, black; the black stripes as on the upper side; cilia white. Body and legs pale ashy-brown; front tibiae barred with black.

Variable in the depth of ground colour of the fore wings as already indicated, still more so in the depth and extent of dark clouding, which in some examples is hardly existent, in others is so deep and extended that the white about the stigma is obliterated; while in other specimens, otherwise extremely, dark this shows up clearly and conspicuously. One of the most beautiful forms is strongly tinged with soft yellow-brown, and has oval spots of orange-ochreous between the second and subterminal lines. Sometimes, in the female especially, the basal and dorsal region of the hind wings is tinged with black. In the collection of Mr. S. J. Capper is a specimen having the black band of the hind wings of nearly double its usual width.

On the wing in July and August.

LARVA elongated, attenuated at each extremity; ninth segment swollen and humped; twelfth segment humped and with two dorsal prominences; all the dorsal spots raised into little red warts emitting black bristles; undersurface much flattened; a fringe of fleshy filaments extends along the sides above the legs and prolegs, which sprawl outwards; head hardly bifid, pale brown; face flattened and outlined with black; general colour greyish-brown with a greenish tinge and dusted with black; the fifth segment, and the incisions between the eighth and ninth and the tenth and eleventh, paler, the hump on the ninth tipped with ochreous; spiracles edged with black; undersurface greenish cream-colour, with four conspicuous purplish-brown spots between the prolegs; legs tinged with pink. (C. Fenn.)

April to June on oak; when very young preferring the blossoms (catkins), but soon commencing to feed on the leaves, to which it then devotes itself.

PUPA elongate, rounded, tapering considerably to the anal extremity, which is hooked. Reddish-purple—the colour of an Orleans plum—covered with a bluish efflorescence. In a rather strong but loosely-made cocoon of wiry whitish silk

spun among rubbish, under moss, in crevices of bark, or on the surface of the ground. (C. Fenn.) But Mr. Newman found it to spin up "among oak leaves without descending to the ground"; and Mr. W. Buckler says that it spins a loose kind of hammock amongst the oak leaves, and therein changes to pupa, from all which we may conclude that it is much influenced in its arrangements for pupation by its surroundings.

The winter is passed in the egg state.

In all probability the moth sits during the day upon the branches and upper portions of the trunks of oak-trees; it seems rarely to be noticed at that time, yet it is on record that on some afternoons, when the moth is common, it may be seen flying high round the oak-trees long before sunset; at dusk it flies vigorously round them, sometimes so early as to be distinctly visible without a light, and comes eagerly to sugar on the oak trunks. Here it usually sits down quietly with wings closed, or nearly closed, and showing a stripe of crimson, when it is a beautiful object; but sometimes flies off readily, and requires the net for its capture. Apparently its evening flight is over at about half-past eight or nine o'clock. This magnificent species is one of the especial prizes of that most interesting collecting-ground, the New Forest, Hants. Here in certain years, at quite irregular intervals, it may be taken at sugar by dozens, scores, or even hundreds, while in other years, from no apparent cause, hardly a specimen can be found. I do not know of any other locality in the United Kingdom in which it is ever to be found in plenty; it is, however, taken occasionally at Winchelsea and Ewhurst, Sussex; in Dorset, Oxfordshire, and Suffolk; and the capture of a specimen has recently been recorded so near to London as Blackheath. Formerly it was more widely distributed; taken in Richmond Park and Birch Wood, Surrey, also at Windsor and Leatherhead, the woods at Sydenham and Shooter's Hill, Kent, rarely at Darent

Wood in the same county, and even in one locality in Gloucestershire. This appears to be the extent of its range past (so far as is known) and present, in these Islands. Abroad it is found in many parts of Central Europe, South Sweden, Northern Italy, Sardinia, Livonia, Southern Russia, Siberia, Persia, and in some portions of North America.

5. **C. promissa**, *Esp.*—Expanse 2 to 2½ inches. Thorax moderately stout; fore wings pale grey dusted and banded with black-brown; transverse lines zigzagged, deep black. Hind wings rich crimson; the inner black stripe very perpendicular, curved but not angulated; hinder band deep black; cilia white dashed with black.

Antennæ of the male long, tapering, minutely ciliated, black brown; palpi rather short, curved up, broadly tufted, black, the base and tips of the joints white, apical joint a small point; eyes rough, naked, deep black; head white mixed with black, and having a transverse black bar between the antennæ; collar white, repeatedly barred with a mixture of golden-brown and black, and across its upper portion with deep black; remainder of the thorax mottled with pale brown and black and dusted with white, a black edging round each shoulder-lappet, and a similar line across the very small short back crest; fascicles grey-brown; abdomen of the same colour, stout, but tapering to a point; dorsal portion covered with soft light brown hair-scales; lateral tufts hardly visible, anal tuft very narrow. Fore wings moderately broad; costa rather straight or very faintly arched; apex bluntly angulated; hind margin strongly crenulated, oblique but hardly curved; dorsal margin rather filled-out; colour pale grey or whitish-grey, abundantly dusted and mottled with black, and sometimes with pale brown; basal line black, rather straight, abbreviated, resting upon the upper of two black streaks which mark the bases of nervures; first line deep black, very thick, duplicated at each margin, but in the middle and throughout broadly

clouded on its inner side with deep black; second line double, black, thickened, and abundantly waved and angulated throughout, one loop near the dorsal margin so long as to approach the first line; subterminal line double, brown-black, excessively angulated and zigzagged throughout, and enclosing a pale similarly formed stripe; beyond this the hind-marginal area is much dusted with black, and sometimes with golden-brown; reniform stigma rather large, its middle portion being a black angulated cloud with a pale brown centre, surrounded with pale grey, and the whole enclosed by a black edging; beneath it is a large pale spot edged by a black loop which joins the second line; the portion of the wing between the first and second lines is usually pale, the costal portion especially, but in it are two black spots on the costa, and the small beginnings of a central shade on the dorsal margin; along the extreme hind margin is a row of ashy-white dots backed by black lunules; cilia rather crenulated, of the colour of the wing-margin, edged and indented between the crenulations with white. Hind wings moderately broad, rounded and strongly crenulated, rich crimson; inner black stripe rather slender, perpendicular but with faint curves to below the middle of the wing, then curling toward the dorsal margin, which, however, it does not nearly approach; outside it, but with its inner edge not quite parallel, is the usual broad deep black hind-marginal band, very broad at the apex, narrowing off toward the anal angle, its outer edge usually tinged or clouded with crimson; cilia white partially tinged with crimson, but otherwise clouded and interrupted with black. Female extremely similar.

Underside of the fore wings deep black, the base, a large blotch before the middle and a stripe from the costa which tapers off to the dorsal margin, all white; apex dusted, and cilia spotted, with white. Hind wings rich crimson, the black bands as on the upper side, except that the inner is completed to the dorsal margin and is also joined to a large black central lunule at both its extremities, thereby enclosing

a round, partially yellow spot; the portion near the costa, of the stripe between the two bands, is also yellow. Body and legs brownish-white; tibiae barred black and white.

Hardly variable except in the depth and extent of dark shading upon the fore wings and in the presence or absence of light brown dusting or shading in the hinder area.

On the wing in July and August.

LARVA elongated, thickest at the ninth and tenth segments, tapering thence a little gradually to the head, and a little more to the anal extremity; on the back of the ninth segment is a prominent ridge having a triangular hump; and there is a slight elevation near the end of the twelfth, bearing the hinder pair of tubercles, more sharply prominent than the rest; back rounded; undersurface flattened; at the junction of the two, just above the legs, is a fringe of fleshy filaments, simple and branched; the anterior pairs of raised dots on the back are small, while the hinder pairs and the single row along each side are rather large and bluntly pyramidal, every one having a fine bristle; the head rises a little on the crown, where the lobes are slightly defined, and is rather flat in front, light green or greenish-grey, reticulated with darker grey; a transverse streak of black reticulation over the crown extends to the mouth, defining the face, which is whitish with a dark grey streak on either side downwards to the mouth, behind is a short black streak at the back of the cheeks; ground colour of the body light greenish-grey; the thoracic segments much covered with freckles of light and dark grey and black, some of them so disposed as to faintly indicate double dorsal and subdorsal lines; on the fifth segment is a large distinct pale patch of faint ochreous-green on the sides and back, the hinder area being darker; another pale patch on the ninth, and on the tenth less pale, strongly contrasted toward the division by a sooty transverse irregular band extending down either side from the blackish hump on the ninth segment to the back of the leg, whence it spreads

behind, at first broadly, then slants off to a point on the lower side of the tenth; the intermediate and remaining segments freckled with greenish-grey, which on the middle ones forms rather truncated diamond shapes; raised dots white, more or less edged with black or grey; from the hinder proceed short, double but divergent, dark grey lines to the back of the segments, most strongly defined on the fifth and the last three; spiracles oval, dull red, outlined with black; fleshy filaments pearly-white; anterior legs extending laterally, at right angles to the body, pale green, ringed with dark greenish-grey; ventral prolegs similarly extended outwards, the first two pairs whitish-grey, the third and fourth longer, grey in front, darker greenish-grey and freckled behind, the anal pair similar in colour, extended back at an obtuse angle; ventral surface whitish with a conspicuous blackish mark on the middle of each segment, viz. a transverse bar between each pair of the anterior legs, a rather large round spot on the fifth and sixth segments and a very much larger spot each on the seventh to tenth, thence smaller on each of the remaining segments—those on the ninth and tenth of a transverse diamond form. The skin of the head, back, and sides is rough, the undersurface smoother, the filaments smooth. (Condensed from Mr. Buckler's account.)

End of April till June; on oak, feeding upon the leaves, except that when very young it bores into the buds of oak and eats them out, more especially those which contain the blossom; feeding at night; resting by day on the twigs or branches, to which it bears an accurate resemblance.

The winter is passed in the egg state.

PUPA rounded and sloping smoothly to the head in a convex curve; behind, on the back of the abdomen, is a slight depression; wing-covers smooth, and from them the abdomen is full, but soon tapers rather sharply to the tip; cremaster rough, and furnished with several converging curly-topped

spines ; general colour purplish-brown, the abdominal divisions dingy-red, though this local colouring can only be seen on parts which happen to be rubbed, as the surface generally is covered with a fine opaque powdery bluish bloom ; a few short, fine, light brown bristly hairs, pointing backward, are sparingly distributed over the abdomen. In a cocoon composed chiefly of small particles of dry stalks and roots, with peat earth, and lined with coarse whitish silk in large meshes, yet smooth ; placed among light soil just beneath the surface. (W. Buckler.)

The moth appears to hide, like the preceding, in the daytime, in oak-trees, doubtless resting upon the branches or higher portions of the trunks, very difficult to see from its close resemblance to the bark. At early dusk it flies in an extremely lively manner, coming readily to sugar spread on the trunks of oaks, but settling with wings widely expanded and quivering, dashing off when alarmed, flying round and settling again upon the bait. Like the last species, its principal home in these Islands is in the New Forest, Hants ; equally uncertain in its appearances, but, curiously enough, almost always appearing in the same seasons, though often in smaller numbers. Also found, though rarely, and only in woods, in Dorset, Devon and Sussex ; very rarely at West Wickham, Kent, and Leatherhead, Surrey ; near Reading, Berks, and formerly in Gloucestershire, Hunts, and Cambs ; rarely in Suffolk, but formerly to be found in the large woods of West Norfolk, and very probably inhabiting them still. I know of no other localities for it in these Islands. Abroad it is found throughout most parts of Central Europe, South Sweden, Northern Italy, Sardinia, Spain to Gibraltar, Livonia, Asia Minor, Persia, and some parts of North America.

Genus 3. **EUCLIDIA.**

Antennæ simple, faintly ciliated; palpi short, eyes naked; with short lashes at the back; head small, depressed; thorax and abdomen narrow, smooth, not crested; fore wings short and very broad; hind wings broad, the cross-bar slender and placed unusually near to the base; vein 5 consequently long, joined close to vein 4, produced like the rest at the hind margin.

LARVÆ furnished with twelve legs, elongated, smooth, in repose coiling the anterior segments; on low plants.

PUPE in cocoons among moss.

We have but two species—readily distinguished.

A. Fore wings pale grey, marbled with grey-brown, and with white lines *E. mi.*

A². Fore wings hoary purplish-brown with chocolate bands *E. glyphica.*

1. **E. glyphica**, *L.*—Expanse 1 to 1 $\frac{1}{4}$ inch. Body not stout, rather short; fore wings short, very broad, hoary golden-brown, with velvety-chocolate transverse stripes and a similar spot before the apex. Hind wings orange-yellow, clouded with black-brown.

Antennæ of the male simple, slender, minutely ciliated, black-brown; palpi small, nearly erect, slender, dark brown dusted with ashy scales, apical joint minute, pointed; eyes rather small, naked, golden-brown; head depressed, chocolate-brown; thorax narrow but not slender, fluffy with long scales, dull chocolate; fascicles obscure, pale golden-brown; abdomen dull black, slightly dusted with long paler scales; lateral tufts hardly perceptible; anal tuft rather long, ashy white, partially black above. Fore wings broad, squared, costa very faintly arched, more so at the base and apex, which last is very bluntly angulated; hind margin below it straight and

almost perpendicular, curved off below the middle, but the anal angle rather full; dorsal margin straight; colour hoary golden-brown, or pale chocolate with a purplish sheen, sometimes more ashy toward the costa; basal line oblique, forming the outer edge of a black-brown basal blotch; first line also oblique, lying outward from the costa to the dorsal margin, slightly angulated, purplish-white, and forming the inner edge of a rich velvety chocolate transverse stripe; just beyond this, on the dorsal margin, but placed perpendicularly, is a much broader velvety-chocolate transverse stripe, the outer edge of which is the second line, also perpendicular and rather sinuous; immediately outside this is a similar triangular blotch from the costa, and the portion of the second line separating them is white and rather broadened at the margin; similarly the outer edge of this costal blotch is nearly white, and in it are two white costal dots; subterminal line only indicated by a pale shading or clouding of yellowish-brown passing through the pale chocolate area; stigmata hardly perceptible, the orbicular suggested by a small chocolate dot or dash, the reniform by a faintly paler cloud in the second dark stripe; extreme hind margin edged by an undulating line, although the ashy-brown cilia are not crenulated. Hind wings much rounded; dark smoky-brown shaded with long pale hair-scales from the base to the middle and the anal angle; remaining portion bright ochreous-yellow; a partial and broken black-brown band beyond the middle is thickest and blackest in its middle area and interrupted above it; beyond this is a series of dark brown clouds along the hind margin, the colour from them running up each nervure and also outwardly into the cilia, which otherwise are white or pale yellow, and extend along the dorsal margin. Female very similar but stouter, and often with the velvety chocolate stripes of the fore wings more strongly marked.

Underside of all the wings rich orange-yellow; the fore wings having the reniform stigma black, followed by a

slender transverse brown line, and this by an elongated black-brown costal blotch before the apex; hind margin shot with purplish-brown; central spot of the hind wings lunate, black; beyond it is a slender curved brown transverse line, followed by one or two similar clondy spots; hind margin tinged with purple-brown. Body and leg-tufts ashy-white, tibiæ dark brown, barred with the same.

Not variable except a little in the depth of colour of the fore wings, and the extent of dark shading on the hind.

On the wing at the end of May and in June.

LARVA long and slender for the size of the moth; body evenly rounded above, flattened below, tapering a little at the extremities; head slightly wider than the second segment, lobes rounded; anal prolegs extended and forming a distinct angle. Head of various shades of brown, in some cases of a dark sienna colour; in all there is a pale yellow triangular frontal mark, and a distinct streak of yellow on the side of each lobe; ground colour some shade of ochreous-yellow, the darker specimens having a strong tinge of rust colour along the sides; dorsal stripe brown, edged outwardly with yellow, and enclosing a very fine yellow line; subdorsal stripes double, smoke-coloured; between these and the dorsal line are two more irregular yellow lines; another lies beneath the subdorsal, and above the spiracles a yellow line edged on each side with smoke colour; spiracular stripe also smoke colour; spiracles and raised dots black; undersurface of various shades of dull ochreous, with two grey lines down the middle, and a black mark on the seventh and eighth segments. When very young it arches itself in walking quite like a *Geometra*, and is of a semi-transparent pale green barred with dark brown, or nearly black; the hairs rather long; head pale shining brown. When half grown it has lost the true looper style of walking and has become a half-looper, having two pairs of ventral prolegs. The ground colour now varies from pale salmon to dull pink, or

even with a strong yellowish tinge, dorsal stripe yellow, enclosing a fine paler line, the subdorsal lines dull bluish, bordered with smoke colour, and enclosing fine pale grey lines; below this is another irregular pale grey line followed by a bluish line edged with smoke colour; spiracular stripe yellow, rust-red, or pink. The colours vary considerably in different examples, in some the blue side stripes being barely discernible. (G. T. Porritt.)

July and August on various trefoils—*Medicago lupulina*, *Trifolium pratense*, *T. repens*, *Onobrychis sativa*, and other species—feeding during the night, remaining during the day extended along the stalks of its food-plant.

PUPA of the ordinary shape but rather thick and blunt; colour deep purplish-brown, with the spiracles and segmental divisions darker. Powdered over with a violet bloom, more especially so on the head, thorax, and wing-cases. In a cocoon consisting of fragments of its food-plant or other rubbish firmly spun together with closely-woven silk. In this condition through the winter.

The moth flies naturally in the sunshine and settles occasionally upon flowers, but much more frequently in patches of trefoils, especially in masses of hop-trefoil growing upon railway banks, and among luxuriant vegetation in damp fields. It seems to sit in the sun in preference to flying, but starts up at the smallest alarm, to settle again at no great distance, and only flies voluntarily to any extent when the weather is very still and warm. So far as I know, it never moves at night. Its favourite haunts are the banks and wet meadows just mentioned, the edges and sides of woods, fens, marshes, and quarries, and sometimes clover-fields, but it is rather apt to attach itself to restricted and favoured sunny spots. In this manner it is moderately common throughout the South of England to Essex, Cambs, Oxfordshire, Bucks, and Gloucestershire, and is found in smaller numbers in Worcestershire, Herefordshire, Suffolk,

Norfolk, and Northamptonshire; more rarely in Lincolnshire, Yorkshire, Staffordshire, Cheshire, Lancashire, Durham, Cumberland, and Northumberland. In Wales it must also be widely distributed, though the records are few; it is not, however, uncommon in suitable spots in Pembrokeshire. Apparently scarce in Scotland, but found near Hawick, in East Lothian, even in Aberdeenshire, where two specimens have been taken; and in the west in Ayrshire, Lanarkshire, and Argyle. Dr. Buchanan White recorded it for almost all the South of Scotland. In Ireland it is very local, but found near Dublin, in King's County, Westmeath, and more plentifully in Galway. Abroad it seems to range over the whole of the continent of Europe except the coldest portions, Asia Minor, Armenia, Tartary, and the mountain regions of Central Asia.

2. **E. mi**, *Clerck*.—Expanse 1 to $1\frac{1}{4}$ inch. Moderately slender; fore wings short and broad; pale grey-brown marbled with darker, and with pale lines so disposed as to form the features in profile of a human face, with a black dot for the eye. Hind wings yellow, deeply banded and streaked with black-brown.

Antennæ of the male simple, rather thick, minutely ciliated, purplish-brown with paler annulations; palpi rather small, pointing obliquely upwards, blackish-brown, the lower portion dusted with white; eyes brown; head golden-brown mixed with black; thorax narrow, of the same colour, the scales long and rather loosely laid; fascicles whitish-brown; abdomen smooth, rounded, dull black, with a pale yellow ring at the edge of each segment, and a dusting of similar hair-scales; anal tuft narrow. Fore wings short and broad; costa faintly arched toward the base and apex, otherwise straight or even faintly hollowed; apex bluntly rounded; hind margin very gently curved, yet but little oblique; dorsal margin rather full; colour grey-brown dusted with purplish-brown and white; basal line suggested by a small chocolate

cloud; beyond it, on the dorsal margin, is an ovate black spot; first line extremely oblique, yellowish-white, at the dorsal margin curving round and joining the second line, of the same colour, which then forms a deep loop to the middle of the wing and back nearly to the subterminal line, there sharply angled, and thence passing with two flat angles to the costa; subterminal line white or yellow-white, partially double, conspicuous and complete, and edged inwardly by a row of broad black spots; orbicular stigma a distinct round black dot; reniform stigma roughly formed, blackish-brown, its inner margin black and its outer yellowish-white, the latter perpendicular and straight; cilia white, sparingly spotted with pale brown. Hind wings rounded, rather large, yellow; two black stripes from the base, one to the middle, the other along the dorsal margin, unite with an angulated central transverse black stripe, to which also is joined the very large lunate black central spot, in such a manner as to enclose a large blotch of the yellow ground colour; beyond is a series of black streaks on the nervures and of irregular black spots between them, followed by an equally irregular black-brown cloudy band which lies along the hind margin; cilia white, spotted with brown, and distinctly bounded along the base by two brown lines enclosing a yellow one. Female very similar, but with the wings rather smaller and the body a little stouter.

Underside of the fore wings ochreous-yellow, the two stigmatic spots of the upper side black, followed by a sharply angulated incomplete transverse black stripe, outside which the space to the hind margin is faintly blotched with black-brown clouds. Hind wings very similar, the lunate central spot black, followed by a slender, sharply angulated black stripe and some faint clouds behind. Body and legs pale sulphur, fore tibiæ browner.

Hardly variable, except in the tendency toward chocolate-brown or pale grey in the fore wings and toward orange or straw colour in the hind.

The markings of the fore wings are so curious and unusual that attention should be drawn to them. If looked at from the costa they form a curiously-shaped letter **M**, hence its specific name; if looked at from the hind margin, and the round black orbicular stigma be supposed to be an eye, the outline of a profile will be seen of the queerest possible nut-cracker face, whence the species has received the name of that most famous of English witches, Mother Shipton.

On the wing in May and June.

LARVA about one inch and a half long, rather slender, cylindrical above, a little flatter beneath, of nearly uniform width to the ninth segment, but this and the tenth are a little wider; from the latter it tapers to the anal extremity; head larger and slightly broader than the second segment, yellow, the stripes of the body extending in strong relief down to the mandibles; colour of the body bright lemon-yellow, sometimes tinged with ochreous; dorsal stripe double, rather irregular, pale chocolate, followed by two broader, darker chocolate lines, these by two more, equally broad, of the paler chocolate, then a narrow one of the darker shade and another still darker edging the spiracular stripe, which is broad and bright lemon-yellow; the whole ornamentation taken with the ground colour forms a series of alternately chocolate-brown and lemon-yellow stripes. Ventral area less distinctly marked, greyish-yellow in the middle, rust colour at the sides, with a double interrupted chocolate central stripe; at the sides are similar lines close below the spiracular stripe; legs and prolegs greyish-yellow, the latter marked on the outside with rust colour. When very young dingy green with a large yellowish-brown head. When half grown very much as above described, but proportionately more slender; and the ground colour greenish-yellow or pale olive-green. In walking it loops the back precisely in the manner of a *Geometra* moth, and continues this habit until full growth; when disturbed it rolls itself up and feigns

death. (Condensed from Mr. G. T. Porritt's very full account.)

July to September on clover, *Trifolium pratense* and *T. repens*, and also upon grasses, even feeding willingly upon *Phalaris arundinacea*, but doubtless preferring meadow-grasses.

PUPA rather short and thick, of the ordinary form, limb and antenna covers very minutely roughened or sculptured, wing-covers even more minutely so, and without gloss; the trunk-case apparently pushed forward into a small arched prominence in front of the head, segments rather smooth, but the whole of the pupa so covered with a floury whitish bloom that the surface is indistinct; cremaster short and blunt, but round and expanded, having a ridge of deep crinkles round its edge; from its centre projects a bunch of hooked bristles rather twisted together. In a cocoon of dull brown silk spun up among grass leaves, which are in some degree twisted obliquely round it. In this condition through the winter.

The habits of this species are very similar to those of the last. It flies in warm sunshine and frequents flowery meadows and pastures, marshy places, open portions of woods, railway banks and quarries; settles sometimes on flowers, more frequently among grass and herbage, and flies actively if disturbed, yet only to make a circuit and settle again. Apparently common in suitable places in all the Southern, South Midland, Eastern and Western Counties, scarce or local in the Midlands, and to be found here and there in sheltered spots northward to Northumberland; also probably throughout Wales, since it is fairly common in Pembrokeshire. In Scotland near Hawick, and in East Lothian, more particularly upon the Edinburgh coast, and one specimen has been secured in Aberdeenshire; in the west it occurs in Ayrshire and Lanark as well as in the Solway district. Sir Thomas Moncrieffe stated that it might formerly be found at the foot of

Moncrieffe Hill, whence it seemed to have disappeared. In Ireland widely distributed but very local; in Kerry found more especially on the bogs, in Galway upon the limestone, in Londonderry common on coast sandhills. Abroad it is found throughout Central Europe and the temperate portions of Northern Europe; the northern portions of Italy, Spain, and Turkey; the Ural Mountain district, Asia Minor, Tartary, and the mountainous regions of Central Asia.

Family 6. **DELTOIDES.**

Palpi long and slender, either sickle-shaped, the second joint curved up, or porrected, fringed with hair above and with a sharp frontal tuft; legs, especially the tarsal joints, long and slender; wings irregular in their neuration, but vein 5 of the hind wings well developed.

In many species of this family the larvæ have the curious habit of feeding upon dead fallen leaves.

Genus 1. **AVENTIA.**

Antennæ ciliated; palpi not very long, second joint triangular; eyes naked, without lashes; collar raised; thorax otherwise smooth, slender; abdomen also smooth and slender; fore wings falcate, the hind margin excavated; hind wings rather elongated.

We have but one species.

1. **A. flexula**, *Schiff.*—Expanse 1 to 1½ inch. Body slender, fore wings somewhat trigonate, hind margin deeply concave below the apex; hoary-brown with two oblique double direct brown transverse lines; a chocolate cloud below the apex. Hind wings whitish-brown with a similar double transverse line.

Antennæ of the male rather short, simple, minutely ciliated, light brown; palpi not very long, horizontal, porrected, pale

ochreous-brown; eyes prominent, dull deep black; head tufted, tawny-brown; collar similar; remainder of thorax narrow, smooth, hoary-brown dotted with dark brown, the scales faintly divided at the back; fascicles very small, white; abdomen slender, ashy-brown, abundantly dusted with red-brown; lateral tufts hardly perceptible; anal tuft narrow and pointed. Fore wings somewhat triangular, the base very narrow; costa gently curved, apex falcate and sharply pointed; immediately below it the hind margin is deeply and smoothly excavated and filled out to a blunt angle in the middle, then again rather concave to the anal angle; dorsal margin gently curved; colour hoary-brown, paler at the base, shading off toward the hind margin to chocolate, and dusted with the same; no basal line; first line conspicuous, double, oblique, and very straight to near the costa, where it is suddenly bent back, dark chocolate; second line in some degree parallel with it, direct and then bent, double or rather consisting of a distinct pale brown line edged on either side sharply with chocolate, which shades off a little outwardly; beyond this the apical and middle portions of the hind-marginal areas are clouded, especially between the nervures, with dull chocolate, through which a slender, meandering, faintly white subterminal line endeavours to make its way, but often is hardly distinguishable; apex darker brown or nearly black; in the hollow below it is the richest shade of chocolate; half way between the first and second lines, in the discal cell, are two perpendicularly placed black dots; cilia concolorous. Hind wings rounded and rather long, dusky white dusted with brown, especially so toward the dorsal margin; from this margin, above the anal angle, arise two closely parallel brown lines enclosing a slender yellowish-white transverse stripe which does not fully cross the wing; nearer the hind margin is a very faint waved whitish transverse line; cilia pale grey-brown, intersected by a brown line. Female very similar, body a little stouter.

Underside of the fore wings pale yellowish-brown shading off to rich orange-brown in the apical region; the black dots

of the upper side joined so as to suggest a slender reniform stigma; beyond this is a single oblique curved transverse line of reddish-brown dusting. Hind wings of very similar colour and shading, and the transverse line continued on to the dorsal margin; beyond it is a faint cloudy smoky-brown line; central lunule very obscure. Body and legs reddish-brown.

Rather variable in the depth of the ground colour from pale drab to dark grey-brown. In the darker forms both transverse lines are well margined with chocolate; in some of the greyer forms hardly margined at all.

On the wing from the latter part of June till the beginning of August.

LARVA, when full-grown, seven-eighths of an inch in length, widest at the ninth and tenth segments; convex above, flat beneath; below the spiracles is a rather inflated projecting ridge fringed with a row of fleshy filaments, some of these filaments simple, others branched or forked; head full but rather narrower than the second segment, whitish-green, marked with spots and curves of black upon each lobe and about the mouth; body dull pale bluish-green or greyish-green, or with this colour tinged with brownish-ochreous, the sides paler; dorsal line darker green, broken into a series of spear-points faintly edged with whitish-green and by short black streaks at the end of each segment; subdorsal line a faintly paler tint, hardly visible except at the segmental divisions, but edged above by a fine sinuous black line and by a darker green line below; the ninth and twelfth segments darker in tint than the rest; along the subdorsal region, upon the thoracic segments, are slight curves of blackish dots or dashes; on the sides of the remaining segments is a broad streak of whitish-green; raised dots black at the tips on a base of whitish-green; spiracles indicated by dark brown rings; filaments greenish-white; undersurface flat, dull pale bluish-green; legs well developed, spotted with black; pro-

legs ten in number, but the first two pairs very short and apparently not used in walking, and the anal pair the largest; of the colour of the body, but a black streak runs down the front of the fourth pair. (W. Buckler.)

September till May on the lichens which grow upon old hawthorns, blackthorns, crab and apple trees, cherry, larch, spruce, and yew, probably upon almost any tree lichens, feeding at night, remaining closely at rest upon the lichen during the day. Mr. Buckler urges its very close agreement with the larvæ of *Catocala* in the fleshy filaments on its sides, in its manner of walking and of resting.

PUPA of the *Noctua* form, rather slender, the mouth forming a rounded projecting knob; limb and wing covers extremely smooth and apparently without sculpture, but not very glossy, the head portion most so; segments excessively channelled or wrinkled in incised lines round their circumference, but the hinder edges smooth and prominent, also pale drab, the rest of the segments being red-brown and the wing and limb covers pitchy-brown; cremaster short, conical, smooth, dark brown, furnished with a tiny bunch of curled bristles. In a yellowish-white cocoon of tough silk, placed within a drawn-together leaf.

The moth is apparently rather inactive. It sits in the day-time in trees of any thick growth, or on which lichens are abundant, such as oaks, thorns, crab-trees, yew, larch and other firs, or even in large thick hedges, and when beaten or shaken out flutters lazily down into some other concealment, or on to the ground; doubtless it flies at night, but seems rarely or never to be captured at that season, and not to be attracted by flowers or other sweets, and hardly by light. Local and uncommon in this country, but found occasionally at Haslemere, Boxhill, Gomshall, and elsewhere in Surrey; in various localities in Kent and Sussex; in the New Forest, Woolmer Forest, and Bournemouth, Hants; in the woody heaths of Dorset, Wilts, and Berks; in Middlesex, Essex,

Suffolk, Norfolk (many places), Cambridgeshire, Oxfordshire, Somerset, and Gloucestershire, and rather commonly in East Devon. This is the extent, I think, of its ordinary range, but one specimen seems to have been taken at Chartley Moss, Derbyshire; and two localities are on record in Yorkshire. Apparently absent from Wales, Scotland, and Ireland. Abroad it is found in most parts of Central Europe, in Southern Sweden, Northern Italy, and Livonia, but does not seem to extend beyond Europe. In Asia and America three or four curious closely allied species are known, but as a group these seem to stand quite alone.

Genus 2. **BOLETOBIA.**

Antennæ of the male pectinated and very faintly ciliated; palpi long, straight and slender; eyes rough, but naked and without lashes; head tufted in a blunt knob; thorax narrow, much crested at the back; abdomen slender, smooth; fore wings rather ovate, with rounded costa and hind margin; dorsal margin of the hind wings furnished with long curved hair-scales which bend over the body.

We have only one species.

1. **B. fuliginaria**, *L.*—Expanse $\frac{3}{4}$ inch. Palpi long, straight, very slender; fore and hind wings rounded as in a *Geometra*, black-brown or smoky-black, each with three lines of short yellowish streaks and angles; costa of fore wings dotted with the same.

Antennæ of the male pectinated with solid, minutely ciliated teeth to three-fourths of their length, whence they taper off, the remainder being threadlike, black-brown; palpi rather long, straight, very slender, black, usually porrected or pointed obliquely downwards; eyes rough, black; head and thorax smooth, dull smoky-black; fascicles very small, dusky-white; abdomen slender, black, dusted with pale yellow, and each segment faintly edged with the same;

lateral tufts minute, anal compressed. Fore wings short, rounded, almost ovate; costa gently arched; apex bluntly rounded; hind margin smoothly curved, hardly oblique; dorsal margin a little filled out; colour smoky brown-black; first line slender and obscure, curved, indented, yellowish-white; second line of the same colour, slender, zigzagged throughout, and broadened at the dorsal margin; subterminal line a similar series of short angulated streaks more or less joined together, and followed close to the hind margin by another such series; middle area between the first and second lines clouded with black; beyond this the costa is dotted with yellowish-white; extreme hind margin edged with an undulating black line; cilia smoky-black, regularly dashed with yellowish-white. Hind wings rather short, rounded behind, very similar to the other pair; black-brown, clouded in the middle with black, and beyond abundantly dusted with yellowish-white dots and atoms placed roughly into three series, the first broadened into a pale yellow blotch at the dorsal margin, the third lying in dots along the hind margin, which is edged by an undulating black line; central spot black; cilia crenulated, smoky-black with whitish dashes. Female similar, but with simple antennæ and the body a little stouter.

Underside of all the wings dull smoky-brown; costa of the fore wings and all the cilia dotted or dashed with pale yellow; a faint yellow transverse stripe just beyond the middle is continuous on all the wings, outside it is a faint slender indented similar shade, most visible on the hind. Body and legs smoky-black, tibiæ barred with yellow.

This species bears a singular general resemblance to a shape usual among the *Geometridæ*, and has in consequence, until recently, been placed among them. The structure of its palpi, however, seems conclusive as to its proper position.

On the wing in June and July.

LARVA with twelve feet. Moderately stout, cylindrical, attenuating slightly at both ends. Ground colour sooty-

black; dorsal line marked by ten pairs of orange-coloured raised tubercles, two on each segment. The four middle segments have also a second pair of smaller and less distinct tubercles, from which spring long and curiously recurved hairs; spiracular line also indicated by a row of raised orange-coloured tubercles. (W. H. Tugwell.)

August to June upon fungi growing on rotten wood in wet places. Hofmann says on *Parmelia* (a lichen) and on *Polyporus* (a fungus). Mr. Tugwell found it upon black sooty-looking masses of fungus, which were not in a condition to enable him even to ascertain to what genus they belonged, but upon this unpleasant-looking material the larvæ fed and thrived.

PUPA apparently undescribed, in a cocoon slung by each end, attached to the fungoid mass on which the larva has fed.

A rare and excessively local species in this country, indeed almost confined to the Metropolis. Haworth wrote in the beginning of the present century that he knew of four British specimens in collections. Stainton fifty years later wrote that the only known localities here were "Blackfriars Bridge, Fleet Street, and a coal cellar at Chelsea"—all in London. One seems to have been taken in Upper Thames Street in 1859 and another in 1879. Others are recorded as taken in the City in 1855, 1862, and 1870; in 1864 one at Clapham; and in 1881 two in the City and three in the neighbourhood of Dockhead, on the south side of the Thames. Here also in subsequent years the larva was found, as already described, and it is probable that a good many were reared, since Mr. Tugwell alone had a dozen specimens. Yet the produce from this source has not apparently continued, nor do I find any record in London for some years past. A single example is said to have occurred at Croome, Worcestershire, at some date earlier than 1860, but so far as I know the capture was not confirmed, and the specimen may have

been a variety of some other species. One also was recorded at Hull in 1896. Possibly, if all the old rotten woodwork in the cellars and other structures along the banks of the Thames could be examined, the results would be by no means so meagre. Probably the climate of this country is unsuitable to its constitution, so that it can only exist in specially sheltered and secluded spots. Abroad it is not scarce, and appears to find suitable food growing in more exposed positions. It is found throughout Central Europe, the more temperate portions of Northern Europe, Northern Italy, the Balkan States, Eastern Siberia, and Asia Minor.

Genus 3. **MADOPA.**

Antennæ thickly ciliated; palpi only moderately long, tapering, porrected or pointing obliquely downward, thinly scaled; eyes very full, naked, without lashes; head having a long tuft of scales projecting forward over the palpi; thorax and abdomen smooth and rather slender; fore wings broad and truncate; hind wings broad; legs normal.

We have but one species.

1. **M. salicalis**, *Schiff.*—Expanse 1 to $1\frac{1}{8}$ inch. Body slender; fore wings somewhat trigonate, retuse, and full behind, slate-grey, with three transverse chocolate lines, the third running into the apex. Hind wings brownish-white with a faint transverse streak.

Antennæ of the male short, strongly ciliated, with fine bristles rather resembling pectinations; palpi not very long, horizontal, broadly but smoothly covered with scales, chestnut-brown; eyes prominent, brown, naked; head smooth, the scales lying prostrate but pointing forwards in a produced tuft which almost overlies the palpi; thorax small and narrow, smooth, slate-grey; fascicles short, white; abdomen rather slender, smooth, hoary-grey; lateral tufts very inconspicuous, anal tuft thick. Fore wings somewhat trigonate, smooth,

and faintly glossy; costa slightly arched throughout; apex sharply angulated and pointed; hind margin concave immediately beneath, then much expanded, but below the middle rounded off; dorsal margin almost straight; colour slate or bluish-grey, with a hoary dusting, divided at fairly even intervals by three chocolate-red transverse lines; the first very slender, slightly oblique and nearly straight; the second thicker, edged inside with pale yellow, more oblique, nearly straight, and placed in the middle of the wing; the third still thicker and more fully coloured, edged inside with yellowish-white, running inward from the apex of the wing in a full curve to the dorsal margin before the anal angle; outside this the hind-marginal space is rather darker slate colour, shading into chocolate at the apex, the extreme margin faintly dotted with darker grey; cilia slate colour. Hind wings smoky brownish-white, rather paler and more shining along the costal region; from the anal angle arises a partial transverse grey-brown streak or cloudy stripe, edged inside with white, and shading off outwardly along the margin; cilia greyish-white. Female quite similar, but with simple antennæ, and the body a little thicker.

Underside of the fore wings pale smoky-brown shading off to pale grey at the dorsal and hind margins, but with the nervures browner; there is a faint indication of a slender brown line across the middle of the wing. Hind wings white, abundantly dusted with light brown, and with a faint similar central curved transverse stripe. Body and legs whitish-brown.

Extremely constant in colour and markings.

On the wing from the middle of May till the middle of June.

LARVA with fourteen feet; slender, weak, head half rounded, green; body apple-green or blackish grey-green with the divisions of the segments yellowish; spiracles black; under-surface green-grey. (Hofmann.)

July and August on willow, especially *Salix caprea*, also upon aspen bushes.

PUPA shining black-brown, slender; in an elongated silken cocoon covered with vegetable refuse. In this condition through the winter.

The moth, which is very rare in this country, frequents damp open woods in which willow is abundant. Here it may, in its very few favourite haunts, be found hiding, in hot weather, among the long grass in damp wood paths, or else in the short thick bushes of oak or willow undergrowth which spring up after the cutting of the taller wood for hop-poles and other useful purposes. From these it is easily disturbed in the daytime by the beating-stick, or, when hiding among grass, by simply walking through it, but flies to no great distance, alighting in some similar place, again to take wing if disturbed. It is most alert in the afternoon from 2 to 6 P.M. It certainly flies also, and probably more freely, at night, since I once found a specimen sitting upon a gas-lamp at midnight. Its position then was very curious, the wings drawn so closely together that the moth formed a narrow perpendicular ridge like *Cilia spinula*. It has a tiresome trick of changing its haunts, so that the place in which it may be found for one or two seasons seems to know it no more for ever—at least this is my experience in repeated visits to its haunts of thirty years ago. Haworth, writing in the beginning of this century, stated that it had formerly been taken in considerable plenty, but that for thirty years it had hardly been found in England until within two or three years of the time when he was writing, when a very few had been taken at Charlton, Kent. Bexley, Shooter's Hill, Darent Wood, West Wickham and Tenterden, in the same county, and Birch Wood, Surrey, were subsequently added as localities. In 1858 it must have become domiciled almost in the London suburbs, since I took a specimen on a gas-lamp at *Dulwich*. In 1862 I found it at Haslemere, Surrey, and

took several specimens, and others in subsequent years till 1866, since which date it seems to have disappeared from that locality. At the same time it was taken for several years near Sevenoaks, Kent, with a similar result. In 1877 it was found at Petersfield, on the border of Sussex and Hants, and, so far as I can ascertain, has not since been taken in this country. Its range with us seems, therefore, to be limited to Kent, Surrey, Sussex, and possibly Hants. Abroad it inhabits many parts of Central Europe, Northern Italy, Livonia, Dalmatia, and Southern Russia. Also certainly found in Japan, and apparently in North America.

Genus 4. *ÆTHIA*.

Antennæ ciliated; palpi not long, curled closely up; eyes naked, without lashes; head depressed, not tufted; thorax and abdomen slender and smooth; fore wings broad, rounded behind; legs normal.

We have one species only, if now any.

1. *Æ. emortualis*, *Schiff.*—Expanse $1\frac{1}{8}$ to $1\frac{1}{4}$ inch. Body slender, palpi thin, recurved; fore wings blunt, pale olive-drab with two straight paler transverse lines. Hind wings very similar, but with only one distinct transverse line.

Antennæ of the male short, simple, ciliated, pale drab; palpi moderately long, thin, pointed, curved up, light brown; eyes black; head and thorax smooth pale olive-drab; abdomen short, round, moderately slender, drab dusted with grey; lateral tufts hardly perceptible; anal tuft compressed. Fore wings moderately broad, blunt; costa very gently arched; apex squarely angulated; hind margin rather straight, very little oblique, rounded off below the middle, dorsal margin a little rounded; colour olive-drab or very pale olive-brown, with a faint regular dusting of deeper brown; first line slender, direct or very faintly curved, almost upright, yellowish-white; second line more noticeable, oblique, curved, not

indented, yellow-white; no subterminal line; reniform stigma suggested by an erect whitish streak in the discal cell; extreme hind margin defined by a slender brown line, edged outside with pale yellow; cilia pale drab, dusted with pale yellow. Hind wings rather narrow, the hind margin but little rounded, while the apex and anal angle are somewhat squared; colour olive-drab, rather more dusted with grey-brown; in the middle is a yellowish-white, nearly straight, transverse stripe, continuous with the second line of the fore wings; cilia brownish-drab dotted with pale yellow. Female similar.

Underside of all the wings of a paler shade of the colour of the upper side, the markings similar but less distinctly indicated. Body and legs brownish-drab.

Apparently not variable.

On the wing in June and July.

LARVA with fourteen feet; thickened in the middle, tapering behind; head small, round, red-brown, edged with black; body brown-yellow with a browner dorsal line; subdorsal lines interrupted, black; raised dots black.

August and September on fallen oak-leaves and on low bushes. (Hofmann.) Curtis says that it feeds on oak in September, and makes no mention of fallen leaves; indeed, there would be none at that time except the old and decayed leaves of the previous year. It does not seem quite clear that these are not the chosen food.

PUPA yellowish-brown, with two crooked spikes on the anal segment. In a slight cocoon on the ground. (Hofmann.)

This species is excessively rare in this country and very little is known of its habits. It seems to occur in open woods and to be readily disturbed in the daytime; it certainly flies at night, since it has been found at sugar. It was first recorded here by Haworth, but without locality, later by Curtis, and by Stephens, but the latter author seems to have been misled as to the description and food of the larva. He

stated that he possessed a specimen of the moth captured in Devonshire. Curtis furnished fairly correct information as to the larva, adding that it is double-brooded abroad. The first specimen of which we seem to have any definite account was taken at Brighton, Sussex, on the 18th June 1858, and was recorded with a sufficiently accurate description by Mr. H. Cooke. The next was obtained by Mr. Chas. Healy by beating a beech-tree in Epping Forest, Essex, on the 12th June 1859; and another was secured that year at sugar, in the middle of July at Marlow, Bucks, by the Rev. B. H. Birks. I know of no other well-attested captures in this country. Abroad it seems to be fairly common in Central Europe, and to be found in the South of Sweden, the North of Italy, Livonia, Dalmatia, the Ural Mountain district, and in Tartary.

Genus 5. **HERMINIA.**

Antennæ pectinated with fine teeth or bristles; palpi long, slender, projecting or curved upwards; eyes naked, without lashes; head furnished with projecting tufts; thorax and abdomen slender and smooth; legs tufted, sometimes extraordinarily so, occasionally incomplete; fore wings broad and rather short.

LARVÆ with sixteen legs; rather stout, of obscure habits.

We have five species, not difficult to discriminate.

- A. Wings all light yellow-brown; a slender brown line crosses them all. *H. derivalis.*
- A². Wings all nearly white, a black dot in the discal cell, dotted lines behind. *H. cribralis.*
- A³. Fore wings with three transverse lines, the second slender and curved.
- B. Fore wings coarse, grey-drab; hind wings clouded, white. *H. barbalis.*
- B¹. Fore wings light brown, hind wings smoky-brown.

- C. Third line of fore wings nearly straight, terminated before both apex and anal angle. *H. tarsipennalis*.
 C². Third line of fore wings arched from apex to anal angle; a small species. *H. grisealis*.

1. **H. derivalis**, *Hüb.*—Expanse $1\frac{1}{8}$ to $1\frac{1}{4}$ inch. Body slender, fore wings rounded behind, yellow-brown with two slender curved brown transverse lines, and a central crescent. Hind wings of the same colour, with a single slender similar line.

Antennæ of the male slender, but ciliated with rather long distinct bristles which resemble pectinations, light yellow-brown; palpi very long, slender, curved up to considerably above the head, light chestnut; eyes black; head and thorax smooth, brownish-drab; fascicles pale yellow; abdomen slender, paler drab, dusted with brown; anal tuft long and narrow, yellow-brown. Fore wings broad, rather retuse; costa gently arched; apex angulated and faintly produced; hind margin, below it, straight or slightly retuse, but filled out in the middle and only rounded off close to the anal angle; dorsal margin straight or slightly concave; colour uniform, yellow-brown; first line slender, curved but erect, reddish-brown; second line similar in colour, rather more distinct, not very oblique but curved out above the middle and then back to the costa; no subterminal line; reniform stigma suggested by a short erect brown streak, slightly crescent-shaped, in the discal cell; extreme hind margin faintly edged by a brown line; cilia of the ground colour. Hind wings large, rounded behind, yellow-brown, a little whiter toward the base and along the costal margin; in the middle is a very slender curved brown transverse line continued from the second line of the fore wings; hind margin edged by a slender similar line; cilia yellow-brown. Female hardly differing except that the antennæ are quite simple and the abdomen a little thicker and more pointed.

Underside of all the wings light yellow-brown; a slender

gracefully curved transverse brown line is continuous through the middle of each. Body and legs yellow-brown.

Not variable.

On the wing at the end of June and in July.

LARVA nearly three-quarters of an inch in length, thick in proportion, cylindrical and tolerably uniform in bulk, though the two or three hinder segments appear the stoutest, particularly when it is walking; the thirteenth segment is tapered behind, and beneath its extremity the small anal pair of prolegs come very close together; the ventral prolegs are short and much beneath the body, the legs also small; head globular, velvety, brown; skin soft, smooth and velvety, dark brown covered with an exceedingly fine and short pubescence resembling the pile of fine silk velvet, this where the light reflects appears of a pearly whiteness; there is a faint indication of a darker dorsal line and a still fainter suggestion of a subdorsal line; raised dots black but only just discernible; spiracles of the ground colour, ringed with black, and beneath them the ground colour is of a paler brown than the back; a narrow plate of rather darker brown across the middle of the second segment is divided on the back by a thin line of the ground colour.

The newly-hatched young larva is about one-sixteenth of an inch long, and has a large pale brown head; the body whitish and pellucid; its internal broad vessel of dark brown shows through the skin to the full width of the thoracic segments, and thence tapers to a blunt point within the tenth; the usual raised dots are blackish and shining, and each bears a long pale hair. Soon the dorsal plate begins to appear, and when it attains the length of a quarter of an inch the skin becomes opaque, rusty-brown, closely resembling the dead leaves on which it feeds, and thus it remains through hibernation till May, when the adult colour is assumed. It hibernates in a little nook or corner of a dead leaf, formed by turning down the edge and securing it by three or four

stout silk threads; or else by joining a part of one leaf to another by similar means. (W. Buckler.)

August to June, on dead oak leaves lying upon the ground.

PUPA nearly six lines long, smooth and cylindrical, moderately stout, the abdomen tapering off evenly and ending in a spike, furnished with two larger and six smaller spines with curled tops; colour purplish-brown, without gloss except just at the segmental divisions of the abdomen; terminal spines reddish-brown. In a corner or between two leaves held together by a few short stout silken threads, with a slight lining of silk round the interior, holding the pupa steady by its anal spines. (W. Buckler.)

The moth is found in woods, where it hides among the undergrowth in the more open places, and may readily be disturbed in the daytime. At dusk it flies of its own accord, and will come to sugar and also to a strong light. A very local species in this country, and apparently confined to the south-eastern portion. Taken in several localities in Kent—Canterbury, Tenterden, Dover, Darenth Wood, formerly at Bexley, and near Woolwich; more frequently in Sussex, at Battle, Hastings, Lewes, and Abbots Wood, and in the last two comparatively common. The only other locality known to me here is in the Colchester district of Essex. Abroad it has a wide distribution through Central Europe, Italy, Finland, Livonia, the Balkan States, Southern Russia, Armenia, Asia Minor, and Tartary.

2. *H. barbalis*, *Clerck*.—Expanse $1\frac{1}{8}$ to $1\frac{1}{4}$ inch. Body slender; palpi very long, curved upward and curled back; fore wings dull greyish-drab with three transverse lines, the third nearly straight. Hind wings dusky-white with partial cross-stripes. Fore legs with large fans of hair-scales.

Antennæ of the male pectinated with very slender bristle-like curved teeth, ciliated, pale brown; palpi long and slender,

curved up to far above the head, and with the tips curled back, grey-brown; tibiæ of front pair of legs furnished each with a large tuft of long yellow-brown hair-scales, which can be expanded like a fan or laid together close to the limb at will; tarsi thickly covered with scales almost to the feet; head and thorax smooth, brown-drab; fascicles thin, white; abdomen slender, smooth, grey-drab; anal tuft very narrow. Fore wings broad and obtuse; costa gently arched; apex bluntly angulated; hind margin faintly curved, very little oblique; anal angle prominent; dorsal margin straight; colour dull drab thickly and coarsely dusted all over with brown; first line slender, erect, rather bent above the middle, grey-brown; second line of the same colour, more distinct, placed in the middle of the wing, erect, but forming a strong curve outwards above its middle; subterminal line more conspicuous than either, brown, almost straight and complete from the costa before the apex to the dorsal margin before the anal angle; it is, however, more dusted and less definite than in the two following species; reniform stigma represented by a rather erect curved streak or crescent, which often is so united with the curve of the second line as to form a rounded loop; extreme hind margin edged by a slender brown line; cilia olive-brown dappled with paler. Hind wings rather long, the hind margin curved and a little sinuous, dusky-white, clouded from the base with smoky-brown, cut off by a partial central darker transverse line which arises on the dorsal margin; beyond it is another, rather longer and edged outwardly with white; cilia smoky whitish-brown with a dull brown basal line; costal region shining white. Female similar, but with simple antennæ and untufted legs; the abdomen slightly thicker and more pointed.

Underside of the fore wings dull yellow-brown dusted with paler; dorsal margin yellowish-white; a faint angulated pale brown transverse line lies beyond the middle. Hind wings yellowish-white; the central spot small, dark brown; beyond it are two slender transverse smoky-brown lines;

hind margin yellow-brown. Body and legs brownish-drab.

Not variable, except in a small degree in the extent and depth of colour of the dusting of the fore wings.

On the wing from the end of May till the beginning of July.

LARVA five-eighths of an inch in length; thick and stumpy in proportion; thickest in the middle; head globular and smaller than the second segment; segments and transverse folds distinctly brown; all the legs tolerably well developed; ventral surface slightly flattened. Ground colour deep, rusty reddish-ochreous, with a pattern of diamond figures on the back and sides as follows: down the back a row, one diamond on each segment, the widest part behind the middle of the segment, and the blunt ends meeting at the segmental divisions; this row is filled up with faintly blackish freckles and is traversed by the dorsal line, which is dull black; next below this is a row of diamond outlines, the widest part of each at the segmental fold, the ends meeting just behind the middle of each segment where the dark dorsal diamond is at its widest; below this is another row alternating in the same manner, the widest parts extending down to the spiracles; these lateral rows, though only outlines, are also filled with freckles, but so faintly as to be scarcely noticeable; usual raised dots blackish, set in rings of the ground colour; spiracles black; segmental divisions pale ochreous; head rather dusky; skin soft and velvety. (Condensed from Mr. Buckler's description.)

August to October, hibernating when nearly full grown, but feeding again a little in the spring. On dead leaves of birch, oak, and alder upon the ground, also upon birch catkins in the spring. But the Rev. H. H. Crewe says that he obtained larvæ by *beating* birch and oak, and that after hibernation they gnawed the outer cuticle of the bark of whitethorn and gooseberry. Probably any withered similar

vegetable substance may be attacked in the absence of dead leaves.

PUPA rather long and slender; thorax and wing-covers deep red, or red-brown suffused with black; abdomen red or red-brown with a central black dorsal line; tip of the abdomen rather rounded and furnished with several curly-topped spines; general surface sculptured with fine punctures and almost without gloss, except at the segmental divisions, which are rather shining. In a very slight cocoon of silk and morsels of rubbish on the ground, or in any suitable corner. I have found it spun up in a chink of the bark of an oak-tree, quite visible through its slight cocoon.

The moth is attached to open woods and hides in the day in thick bushes, apparently much preferring large salallows. From these it is readily disturbed, and when beaten out flies wildly to some distance to hide in a similar place. Its voluntary flight is at dusk and in the night, and it does not seem to be much attracted by sugar or light.

Common in suitable woods in Surrey, Kent, and Sussex; scarce in Dorset, not common in Devon, apparently absent from Cornwall, and rare in Somerset; otherwise to be found throughout the South of England and the Eastern Counties, also in Wyre Forest, Worcestershire, Herefordshire, Staffordshire, Leicestershire, and even locally in Yorkshire; but I find no record for any other part of the United Kingdom. Possibly this is only for want of observation, since this species and many of its allies have been here classed among the *Micro-lepidoptera*, and therefore by many entomologists disregarded.

Abroad it is widely distributed through Central Europe, the temperate portions of Northern Europe, Italy, Turkey, Southern Russia, and Asia Minor.

3. **H. tarsipennalis**, *Tr.*—Expanse $1\frac{1}{8}$ to $1\frac{1}{4}$ inch. Body slender, palpi long, thin, recurved; fore wings smooth,

yellowish-brown, with three transverse slender brown lines, the third conspicuous, nearly straight from margin to margin *before* the angles. Hind wings pale smoky-brown with a partial dark brown line before the hind margin. Large fans on the fore tibiæ.

Antennæ of the male thickly ciliated with fine bristles, which in some degree resemble pectinations, light brown; palpi long and slender, curved back over the head, brown; fore legs furnished upon the tarsi with broad thick fan-like masses of dark brown hair-scales; and upon the tibiæ with much larger tufts of similar scales of a pale yellow colour, which lie close to the leg or can be opened at will into a widely-expanded fan; uncovered portions of the tarsi short; head and thorax smooth, pale brown, the latter narrow; fascicles very small, dusky-white; abdomen rather long and slender, dull pale brown, with a faint white edging to each segment; anal tuft small. Fore wings somewhat oblong, broader toward the base and less broad toward the hind margin than in the last species; costa very gently arched; apex bluntly angulated; hind margin but little oblique and very faintly rounded, the anal angle well formed; dorsal margin straight; colour smooth dull yellow-brown, almost rust-brown, faintly dusted with darker; first line very slender, rather curved and only slightly indented, dark brown; second line of the same colour, erect and placed in the middle of the wing, widely curved above the middle, curving in again to the costa; subterminal line conspicuous, deep brown, almost straight and complete, arising from the dorsal margin *before* the anal angle, and attaining the costa *before* the apex; reniform stigma suggested by a small brown crescent or erect curved line opposite to the curve of the second line; cilia yellow-brown. Hind wings rather elongated toward the apex, which is somewhat squared, shortened near the anal angle; hind margin much rounded; pale smoky-brown with the costal region white; near the hind margin and arising from the anal angle is an incomplete

dark brown transverse line edged outwardly with white; extreme hind margin bordered by a slender dull black line; cilia of the ground colour. Female very similar but with the fore pair of legs devoid of the curious tufts of hair-scales, the antennæ quite simple and the body rather thicker.

Underside of all the wings very pale smoky yellow-brown; in each is a central black-brown dot followed by two slender brown transverse lines; under portion of the tarsal fans of the male nearly black; body and legs otherwise yellowish-brown.

Usually not variable in any important degree, but the Rev. C. T. Cruttwell has shown me that in Suffolk the fore wings of this species are often of a greyer tinge.

On the wing in June and July. Individuals of a second generation have been reared in confinement in September and October. The second brood is rare and doubtless only very partial out of doors.

LARVA, when full grown, from six-eighths to seven-eighths of an inch in length, moderately stout and cylindrical, tapering just a little at the last two segments and also in front from the third segment to the head, which is globular, dark brownish-grey; dorsal plate rather paler and dull; general colour dull brownish-grey, finely freckled with a darker tint, but in both respects paler below the spiracles; dorsal line blackish-grey, somewhat interrupted in the middle of each segment; subdorsal lines pale greyish-brown, continuous on the thoracic segments, but indicated only by a short dash at the beginning of each of the others, and below this dash there is, lower down on the side, a short thick blackish streak bifurcated a little at its hinder end; spiracles black; raised dots blackish, ringed with paler than the ground colour. The whole skin covered with an exceedingly fine pearly pubescence. (W. Buckler.)

July or August till April, apparently becoming full-grown before hibernation, though not assuming the pupa-state till

the spring. In some instances, however, pupation takes place in the autumn, and the moth appears before the winter. The food is variously stated. One of Mr. Buckler's larvæ was taken off a sallow bush at night in April; but it refused to eat, being full-fed. Others which had been fed up from the egg by the late Mr. Wellman, fed and thrived upon *Polygonum aviculare*, and were reared upon it in the same season. Mr. Alfred Balding informs me that this larva has been found plentifully upon ivy, and that they were beaten out of that plant freely in September, and put into a vessel with ivy leaves. They, however, declined to feed thereupon, and retired for hibernation, yet were duly reared in the following summer. In this case they *may* have been feeding on the dead leaves which become so much entangled in the ivy. Treitschke says that it feeds on raspberry, but Hofmann only gives as the food withered leaves. Probably the creature is not too particular as to its food.

PUPA a little more than half an inch in length; moderately stout; the abdomen tapered off very slightly towards the tip, which terminates in a spike of two diverging recurved spines, its base encircled by six others of shorter lengths; colour dark brown, with but little gloss, the surface being very minutely pitted, except the abdominal segments which are rather shining. (W. Buckler.) Under a leaf on the ground, or within the curve of a dead leaf, in a slight web, sometimes in that in which it has passed the winter.

The moth is more especially attached to hedges, preferring those bordering country lanes, fields, or gardens, hiding itself therein during the day but readily induced to fly by the persuasion of the beating stick; hiding again in a similar place at a short distance. It flies of its own accord at dusk, and will come occasionally to sugar or to light. Common in such situations in all the Southern and Eastern Counties, and westward at least to Devon; also in the Southern Midlands and in Herefordshire and Worcestershire, becoming

scarce in Derbyshire, and very local in Cheshire, Lancashire, and Yorkshire. Probably more widely distributed, but neglected or unnoticed. Doubtless in most parts of South Wales, since it is not scarce in lanes in Pembrokeshire. In Scotland it has been noticed in Ayrshire and Kirkcudbright; and in Ireland at Carlingford and Castle Bellingham, also in the counties of Cork, Galway, Westmeath, and Sligo. Abroad it is recorded from Belgium, Germany, South Sweden, Livonia, Dalmatia, Siberia, and Tartary.

4. **H. grisealis**, *Hüb.*; **nemoralis**, *Stainton*.—Expanse 1 to $1\frac{1}{8}$ inch. Body very slender; palpi long and recurved; fore wings short and blunt, pale brown, with three transverse dark lines, the first straight, the second curved, the third *arched* and running into the apex. Hind wings smoky-white. Fore tibiae furnished with fans of long scales.

Antennae of the male ciliated with fine but visible bristles which suggest minute pectinations, light brown; palpi slender, long and curved up and back above the head, brown; eyes black; head and thorax smooth, drab, or whitish-brown; fascicles white, minute; abdomen slender, pale greyish-brown; lateral tufts hardly visible; anal tuft narrow, first pair of feet aborted at the tarsi, which are clothed and broadened with dense scales, the tibiae being furnished with slender fans of long white or pale brown hair-scales. Fore wings rather short and blunt, narrow at the base; costa gently arched; apex squarely angulated; hind margin below it perpendicular but bent in the middle, and thence more oblique, the anal angle not so sharp as in the last species; dorsal margin straight; colour pale brown or yellowish-brown; first line distinct, oblique, straight, deep brown; second line rather erect, more slender, of the same colour, widely curved outwards from the middle and bending inwards again to the costa; subterminal line rather thick and conspicuous, dark brown, placed in a regular flat arch from the anal angle to the apex of the wing; reniform stigma suggested

by a curved brown streak at the end of the discal cell; along the extreme hind margin is a slender brown line; cilia pale brown. Hind wings rounded, smoky-white; in the middle is a faint transverse smoky-brown shade or line, and near the hind margin another, edged outwardly with white; cilia pale smoky-brown. Female very similar, a little smaller, with simple antennæ, and fore legs untufted and complete; body hardly stouter but more pointed.

Underside of the fore wings pale smoky-brown; a white spot lies in the discal cell; beyond it, in the middle of the wing, is a slender, transverse, brown line; costal and hind margins dusted with brown and pale yellow. Hind wings brownish-white, dusted with yellow-brown; central spot small, brown; beyond it is a curved transverse brown line; another, incomplete, lies near the anal angle. Body and legs pale brown.

Apparently not variable.

On the wing in June and July.

LARVA rather more than half an inch long; head round, smaller than the second segment, dark brown, reticulated with darker, and without gloss; body moderately stout and cylindrical, tapering a very little toward the head and at the anal segment; dingy pinkish-grey, faintly freckled with darker; on the second segment is a small, semilunar, dark brown velvety plate, divided in the middle of the back by a line of the ground colour; dorsal stripe not very visible till the fifth segment, from which it is continuously broad and conspicuous, blackish, rather widened in the middle of each segment, and becoming narrower on the last two; subdorsal lines darker than the ground colour and a little broken; along the spiracular region lies an interrupted line of dark freckles, the spiracles themselves being black and nearly round; raised dots small and black, each in a ring of clear ground colour and bearing a fine hair; undersurface a little paler than the back and without freckles; legs tipped with

black; prolegs with brown. Just before spinning-up the general colouring is more pink. (W. Buckler.)

July to September on oak—at least this is the food upon which fed the one larva described above; and Mr. Buckler states distinctly that it changed to pupa *on the nineteenth of September*, and that the moth came forth on the 5th of June following; by which it would appear that the pupa-state lasted through the winter. Were this usual in the group to which this species belongs this statement would be satisfactory, but this is by no means the case, and I cannot but think that Mr. Buckler possibly made a mistake in the date of pupation. Hofmann says that it lives in the autumn, and through the winter, upon fallen leaves of hornbeam, or more frequently upon raspberry and blackberry bushes; and that it spins up in May among moss. Nettle and sorrel are also given as food-plants. There appears to be here an opportunity for further investigation.

PUPA three-eighths of an inch in length, moderately stout, very glossy, deep chestnut-brown; paler at the abdominal divisions and attached to its web by the tip of the tail, which is furnished with two central bristle-like spikes, recurved at their tips, and near their base surrounded by three or four others, very much shorter and extremely fine. In a thin web of whitish-grey silk, which holds the upper surface of a leaf folded together at the ends, and the sides drawn up a little, so as to form a hollow in the middle. (W. Buckler.)

The moth frequents bushes generally, in woods, hedges, lanes, even gardens, or often will hide among the herbage of a hedge-bank, and is readily disturbed and induced to fly in the daytime. At night it flies gently and rather lazily in similar spots and shows no very special habits or tendencies, or, if any, they seem to have escaped notice.

Generally distributed and rather common throughout the southern half of England, including the Eastern and some of the Western Counties, probably *all*, though records are

wanting; also found locally in the Midland Counties, and in Cheshire, Lancashire, Yorkshire, and Cumberland—doubtless throughout England where properly looked for. In Scotland it seems almost confined to the south-west, being recorded by Mr. Morton at Carlisle, and also found in the Solway district. In Wales it is doubtless generally common, since I have found it so at Pembroke. In Ireland widely distributed—Dublin, Kerry, Sligo, Westmeath, Cavan, Armagh, and Antrim. Abroad it ranges through Central Europe, and is found in the South of Sweden, Finland, Portugal, Piedmont, Southern Russia, and Tartary.

5. **H. cribralis**, *Hüb.*; **cribrumalis**, *Staud. Cat.*—Expanse 1 to $1\frac{1}{2}$ inch. Body slender; fore wings brownish-white, with a central round black dot, and beyond, one or two faint lines of brown dots obliquely crossing the wing. Hind wings white, with a faint brown shading toward the hind margin. Fore tibiae having very long spreading fans.

Antennae of the male pectinated, with very slender but distinct ciliated teeth, brownish-white; palpi very long and narrow, pale brown, pointing obliquely upwards and curved back at the tips; tibiae of the first pair of legs furnished with long narrow tufts of whitish hair-scales, and the knees and tarsi with longer tufts, which can be expanded at the will of the insect into the most exquisite plumes or fans; eyes purple-brown surrounded with white; head otherwise pale brown; thorax white, dusted with pale brown; collar distinctly divided; shoulder-lappets raised; abdomen cylindrical, brownish-white; lateral tufts just perceptible, anal tuft very narrow. Fore wings short and broad; costa faintly arched at the base, thence almost straight; apex sharply angulated; hind margin below it retuse, but strongly filled out in the middle and curved off just above the anal angle; dorsal margin nearly straight; colour brownish-white, with a faint purplish or reddish tinge toward the hind margin; also very minutely dusted between the nervures in this

region with black, they remaining white ; first line absent ; at the end of the discal cell is a round black dot, beyond it a very oblique row or line of black dots, or aggregations of minute black scales, representing a partial second line, which usually does not approach the costa ; subterminal line a row of more or less distinct black dots nearer the hind margin ; cilia yellowish-white or brownish-white. Hind wings white, dusted with brown, and very faintly tinged with reddish-brown toward the hind margin ; cilia rather long, of the same colour. Female a very little smaller, with the fore wings rather narrower and whiter, the antennæ and legs without appendages, the body slightly thicker.

Underside of all the wings pale brown or whitish-brown, dusted with black, and leaving the nervures whiter ; central spot of each wing small, black ; no other markings. Body and legs very pale brown.

Not very variable, but the dotted transverse lines of the fore wings are sometimes hardly perceptible.

On the wing at the end of June and in July.

LARVA rather more than three-quarters of an inch long ; somewhat fusiform, stoutest at the eighth segment, thence tapering to the head and more rapidly toward the tail ; head globular, grey-brown ; second segment slightly narrower, having a shrunken appearance, and unusually short ; general colour pale grey-brown dusted all over with tiny freckles of ochreous-yellow ; dorsal line of a darker tint and edged with pale lines ; subdorsal line paler than the ground colour ; spiracular region also paler and slightly inclined to ochreous ; spiracles small, black ; usual raised dots distinct, darker than the dorsal line ; undersurface paler than the back. (Rev. J. Hellins.)

August to the beginning of June. On willow, *Carex sylvatica*, *Luzula pilosa*, and on various grasses which grow in marshes. Hibernating when about half-grown, in the tufts of grasses.

PUPA slender, rather widened at the shoulders, but otherwise cylindrical and tolerably uniform throughout, the last segment of the abdomen tapering to a blunt spike which is grooved or fluted, in two steps as it were, and its tip set with several small spines having curved ends; colour rich dark brown; the edges of the wing-cases and the segmental divisions of the abdomen of a lighter reddish-brown. In a long oval cocoon, extremely slight, being a very open network of silk, with bits of moss drawn in, but still with interstices left through which the pupa can be seen. (Rev. J. Hellins.) Doubtless placed among dead grasses, or at the bases of tufts of *Carex*, or some similar shelter, on the ground.

The moth seems to be wholly confined to fens and very wet marshes. It is a retiring insect, hiding during the day among the dead sedge-leaves or thick herbage of the fens, and difficult at that time to disturb; but at dusk it flies gently and in a noticeable manner about, or sometimes clings conspicuously to a grass or sedge-blade, and is very easily secured. Occasionally it will come to a strong light, but it does not seem to be attracted by any kind of food. My own acquaintance with it is in the fens of Norfolk, where it is widely distributed though not very plentiful. It is sometimes much more abundant in Wicken Fen, Cambs, and at Chippenham and Fordham in the same county, where formerly it had a wider range through the fens round Whittlesea Mere, at Burwell and elsewhere. Still to be found in Suffolk, and in Essex to Southend and Shoeburyness, always in similar spots; at Deal, Kent; in Sussex, and the moors of Somerset; but this seems to be the extent of its range with us, unless the single record in Cumberland should be confirmed, which appears unlikely. Abroad it is found in Holland, Germany, Switzerland, Hungary, Southern and Eastern Russia, and Tartary.

Genus 6. **HYPENODES.**

Antennæ faintly ciliated, tufted at the base; palpi projecting, thickly tufted, the third joint long, slender and curved up; eyes naked, without lashes; head depressed; thorax and abdomen very slender, thinly scaled, smooth; legs normal, fore wings narrowly triangular.

We have only two species, the larvæ of which are obscure in their habits, and very little known. The perfect insects are readily discriminated.

A. Fore wings pale brown; middle area darker, bordered outside by an oblique black line edged with white.

H. albistrigalis.

A.² Fore wings pale brown with a flat brown triangle on the middle of the costa.

H. costastrigalis

1. **H. albistrigalis**, *Gn. Stn.*; **albistrigatus**, *Haw. Steph. Wd.*—Expanse $\frac{3}{4}$ inch. Small and very slender; fore wings narrow, truncate, pale umbreous with a darker central band, edged outwardly by a black line bordered with white, beyond it is a pale space. Hind wings brownish-white.

Antennæ of the male slender, simple, but rather coarsely ciliated, pale brown; palpi slender, long and sharply pointed, porrected but the tips curved up, brown; legs all long, rather naked; eyes black; head and thorax smooth, pale brown, the latter thin and weak; abdomen unusually slender, pale greyish-brown; on the back of the basal segment is a dark brown dot or raised tuft of scales; anal tuft very thin. Fore wings narrow, particularly so at the base, costa gently arched; apex squarely angulated; hind margin short, scarcely curved, but rather bent in the middle; anal angle well defined; dorsal margin straight; colour pale umbreous; near the base two short black streaks seem to suggest the basal line; first line partial, oblique, somewhat indented, very slender, black; second line also oblique in the same direction—outward from the dorsal margin—deeper black and

distinct throughout, also very little waved or indented, edged on the outside with a dusky white line which shades off into a broad whitish-brown oblique band, beyond which is a faint whiter subterminal line; reniform stigma indicated by a clouded deep black spot; extreme hind margin edged with black streaks or crescents; in the middle area of the costal margin are two pale oblique streaks edged behind with black; cilia purplish-umbreous dotted with paler brown. Hind wings rather long, with a sinuous hind margin; smoky-white, the nervures rather darker; cilia smoky-white. Female very similar.

Underside of the fore wings pale smoky-brown; outer half of the costal margin and the hind margin dotted with white; the second line faintly visible, and the space beyond it a little paler. Hind wings smoky-white with smoky-brown nervures; central spot a streak of the latter colour; beyond it is a faint, similar, transverse shade. Body whitish-brown; legs well furnished with spines; colour pale brown.

On the wing from the end of June till August, and apparently as a partial second generation, in September.

LARVA scarcely known. It is figured in the young state in the *Tijdschrift voor Entomologie*, vol. 23, plate 7, and also described, under the name of *tanialis*. Professor von Leewen obtained eggs, and kept the young larvæ alive till the end of September, when they commenced to hibernate, but died before the spring. These young larvæ he described "slender, but much thickened from the fifth to the ninth segments; head and next three segments quite small, and the fifth very suddenly thicker; the reduction in size from the ninth to the tenth is equally sudden, and the hinder segments continue small; anal prolegs rather extended, and there is a pair of abdominal prolegs on the eleventh segment; the true legs on the other hand being strongly developed"; thus it is at this stage distinctly a looper, and one of the

figures is remarkably bent and humped. Colour dull slate-grey, without markings, the head and feet being of the same colour; the bristles of the body are very distinct though short, and on some of the hinder segments are placed in pairs. It is reasonable to suppose that more fully grown larvæ would have exhibited *some* markings.

August and September, probably till May; but it appears likely that some larvæ feed up rapidly in August, and produce the partial second generation of moths in September. Whether these have offspring is unknown, but if so they must doubtless hibernate in either the egg or very young larva state. The larvæ noted above fed upon blossoms of heather and of thyme, apparently preferring the dead flowers. Probably dead leaves and flowers form the natural diet.

PUPA apparently unknown.

The moth loves to hide during the day in thick bushes, especially those close down among herbage, and prefers the shelter of a wood, or a high hedgebank in a lane, or the slope of a hill. From such a hiding place it may be easily dislodged by the beating stick, but very hurriedly hides itself in another similar covert. Its natural flight is at dusk, when it is strongly attracted by honeydew, the sugar placed on a tree trunk to attract larger moths, and in its autumn emergence, by ivybloom. Apparently to be found in suitable spots throughout the Southern and South-Western Counties of England, to Bucks, Oxfordshire, and Gloucestershire, and the Eastern Counties to Norfolk, also in Herefordshire, and very rarely in Cheshire and Yorkshire. In South Wales I found it, not rarely, in deep hollow lanes in Pembrokeshire. Abroad its range as recorded does not seem to be wide—Southern France, Holland and Germany.

2. **H. costæstrigalis**, *Steph.*—Expanse $\frac{3}{4}$ inch. Small, weak and slender; fore wings narrowly oblong, truncate,

brown or brownish-white ; an oblique white streak from the apex edges a black elongated streak upon the disk ; hind wings dusky white.

Antennæ of the male short and very slender, faintly ciliated, pale brown annulated with white ; palpi long, slender, pointed and porrected, brown ; eyes brown ; head dirty white ; thorax narrow and weak, pale brown ; abdomen very slender and small, brownish-white ; on the basal segment is a dorsal brown spot ; anal tuft small. Fore wings narrowly oblong ; costa gently arched ; apex bluntly angulated ; hind margin below it truncate and hardly oblique, but rather bent below the middle and thence curved off round the anal angle ; dorsal margin straight ; colour brownish-white, clouded along the costal and hind margins with umbreous ; basal line suggested by a deep black streak ; first line oblique, much indented and thickened at the angles, faintly black ; second line also black, very slender and faint, its upper portion appearing to form the margin of a large flatly triangular umbreous blotch which lies along the costa and approaches the apex ; outside this is a stripe of the whitish ground colour, obliquely from near the middle of the dorsal margin, straight to the apex of the wing ; on the outer side of this stripe are two or three black dots and an extremely faint, irregular, whitish subterminal line ; reniform stigma indicated by a small black streak or cloud, sometimes wedge-shaped ; hind margin pale umbreous, edged with black dots, and outside them with a fine white line ; costal margin, beyond the middle, minutely dotted with brownish-white ; cilia pale brown, faintly crenulated. Hind wings elongated toward the apex, shortened toward the anal angle ; the hind margin sinuous ; colour smoky white with a blackish central spot ; cilia white. Female extremely similar.

Underside of the fore wings pale smoky-brown ; reniform stigma indicated by a black cloud ; in the apex is a white cloud preceded by white dots. Hind wings smoky-white central spot elongated, black ; beyond it the surface to the

apex is shaded with brown. Body whitish-brown ; legs very long and slender, pale brown.

Variable in the extent of the umbreous clouding, which often extends from the costal blotch to the base, and occasionally over the whole of the fore wings, which then are unicolorous dull brown, or have only a whitish oblique dash from the apex. Abroad it seems to become still darker, and I have seen specimens from the Island of St. Helena nearly unicolorous black-brown.

On the wing from the end of June till August, and probably in a partial second generation, in September and October.

LARVA, when stretched out in walking, about half an inch in length ; but its general attitude is to "hunch up" its middle segments into a close loop, keeping the front and hinder segments close to the surface on which it is resting ; and for this purpose its figure seems specially adapted, the head and three following segments being much smaller than the fifth, sixth, seventh and eighth, all of which are tumid, the hinder segments being also somewhat smaller ; there are but two pairs of ventral legs, or twelve legs in all. The colour of the back is dark purple or crimson-brown, very glossy, making it hard to distinguish the obscure markings upon it ; along the back runs a slightly paler central stripe ; the subdorsal lines are faintly seen as paler brown lines edged with blackish below ; the sides and undersurface are paler, and more ochreous in tint ; taken altogether, the larva has a general appearance of a dingy dark chocolate colour.

When newly hatched it is quite translucent and glossy, in colour rose-pink, rather paler towards the tail ; the head blackish ; the skin furnished with some bristles. At the end of a week the bristles have disappeared, and also much of its translucent look, and the colour has become more like claret. At the end of another week or ten days much of the purplish-red has vanished, and the colour has become dark brown.

From this the full-grown appearance is gradually assumed. (Rev. J. Hellins.)

July and August, and probably in a second generation in October, but of this we have no direct knowledge, nor of the condition in which the winter is passed. Mr. Hellins' larvæ fed readily upon the flowers of thyme (*Thymus serpyllum*), yet the habits of the moth are not such as to render it probable that this is the ordinary food. Probably flowers—alive or dead—may be acceptable. Possibly a strong taste evinced by the larvæ in question—apparently—for feeding upon *one another* may have arisen from distaste for the food provided.

PUPA blunt at the head, tapering gradually towards the tail, which is rounded, not acute, with a polished surface: pale green, faintly tinged with brown. (Rev. J. Hellins.)

The moth hides among very thick herbage, dense masses of grass and sedge, or thick low bushes, but is unwilling to show itself by day, and when aroused flits very hastily to a similar shelter; yet in the fens it will rise at one's feet, in very hot weather, and fly to a short distance. Its ordinary flight is at dusk, and it will then come to sugar or to thistle blossoms and other flowers, doubtless also to honey-dew. Most frequent in fens and in the edges of wet woods and boggy heaths; very often in the spots frequented by the last species, though perhaps more attached to wet mossy heaths, and more widely distributed. Apparently to be obtained in such suitable spots in all the Southern, Eastern and Western Counties of England, even to Cheshire, North Lancashire, Westmoreland, and possibly Cumberland, in the West, but not, I think, noticed beyond Norfolk in the East. Hardly observed at all in the Midlands, but it reappears, very locally, in Yorkshire. In Wales I have taken it in Pembrokeshire, and have little doubt that it is (secretly) present in many parts of the Principality. Its obscure appearance and retiring habits would cause it very often to be overlooked. In Ireland it has been found at Enniskillen, Cork, Sligo, and

Kerry, but there is little doubt that its actual range is far wider. The only record in Scotland seems to be at Lochgilphead, in the north of the Clyde valley. Abroad it inhabits France, Holland, Belgium, Germany, Hungary, and Galicia, as well as Madeira and St. Helena.

Genus 7. **SCHRANKIA.**

Antennæ notched and minutely ciliated; palpi long, slender, curved throughout into a sickle-shape; eyes naked and without lashes; head depressed; thorax narrow and weak, smooth but with a small knob at the back; abdomen very small, slender, and smooth; legs normal; fore wings narrow and blunt; hind wings rather small.

We have only one species.

1. **S. turfosalis**, *Wk.*—Expanse $\frac{1}{2}$ to $\frac{5}{8}$ inch. Very slender, small, and weak; fore wings narrow, truncate, pale umbreous, with two straight, oblique, darker umbreous transverse lines, the second running into the apex of the wing. Hind wings dark grey.

Antennæ of the male simple, minutely ciliated, brown; palpi slender, not very long, but sickle-shaped and curved up above the head, pale brown; eyes black, but the head is so much depressed that they are not visible from above; head rather broadly covered with scales, whitish-brown; thorax similar, smooth, but with a small raised tuft at the back; abdomen very small and slender, shining pale grey, dusted with dark grey and golden-brown; anal tuft yellow. Fore wings narrow, oblong, truncate; costa a little arched, especially towards the base; apex bluntly angulated; hind margin almost perpendicular, faintly curved, but the anal angle prominent; dorsal margin straight; colour dull pale umbreous, basal half rather the darker; basal line not indicated, and the first line only by the faintest possible irregular black striga, most noticeable towards the costa; second line rather

obscure, oblique, straight, forming the margin of the darker area, often edged with white and containing two or three black streaks or elongated dots; beyond this in the paler area is a faint parallel partial blackish line followed by a more complete and distinct oblique umbreous cloud, or straight cloudy line, running into the apex of the wing; reniform stigma indicated by a black dot or streak touching the second line; all these markings very obscure; cilia pale umbreous. Hind wings long towards the apex, shorter towards the anal angle; hind margin sinuous; colour smoky-white dusted with smoky-brown. Female quite similar.

Underside of the fore wings dull blackish-brown; the nervures swollen and conspicuous; hind wings white, with a shade of black-brown along the costa. Body and legs dull brown, the latter long but normal.

Only very slightly variable in depth of colour and in distinctness of the markings.

On the wing at the end of June and in July.

LARVA and PUPA unknown.

This species seems, so far as these Islands are concerned, to have been first observed in Ireland, where Richard Weaver found it plentifully in bogs in the year 1848; but it does not appear to have been *recorded* till 1850, immediately upon which it was found to be abundant in a moss in Cheshire. It hides during the day among heather in mosses and boggy heaths, or in the tussocks of grass, rush, or sedge, common in such wet localities; and although casual specimens may be trodden out and induced to fly, or even beaten from tussocks

grass, very few specimens are obtainable in this manner, the vast majority tumbling down to the ground or hiding in the thickest of the wet herbage. But from 6.30 to 8 P.M. a very different scene will present itself. The creatures then creep up and fly voluntarily, and in numbers which are an actual revelation to the collector who has previously been, with trouble and disappointment, beating or trampling out

odd specimens. Nothing is then more easy than to get a dozen into the net at one time, for the creatures are not timid nor swift of flight. It should be borne especially in mind that specimens so captured must not be carried far in pill or chip boxes, but if possible should be at once pinned into a damp collecting-box; since they are so fragile, and so liable to die and become dried up if so boxed, that probably not a single specimen will remain fit for setting after being carried in a pill-box for a few miles. Even if pinned in a dry box the result is little better. Probably a more widely distributed species than is even now known; but it has been found, usually in abundance, in localities such as I have described, in Surrey, Hants, Berks, Dorset, Somerset, Gloucestershire, Norfolk (in myriads), Warwickshire, Cheshire, Lancashire, and Cumberland. In Scotland in Perthshire; in Ireland in abundance in the bogs of Kerry, and doubtless in many other places. Abroad its range seems to be limited to Northern Germany, Silesia, Galicia, Livonia, and Finland.

Genus 8. **BOMOLOCHA.**

Antennæ of the male ciliated; palpi moderately long, pointed, porrected, (in the female more slender); eyes naked, but furnished with long, curled, back lashes; head hairy; thorax crested at the back; abdomen ornamented with one to three crests; legs normal; fore wings trigonate, rather pointed, crenulated behind, differing in colour in the sexes.

We have but one species.

1. **B. crassalis**, *Fab.*; **fontis**, *Staud. Cat.*—Expanse $1\frac{1}{2}$ to $1\frac{1}{4}$ inch. Fore wings pointed, broadly triangular, with full hind margin; pale brownish-grey or white, with a large velvety black or chocolate blotch from the costa more than half across the wing, followed by black and white dots and a black or brown apical streak. Hind wings plain.

Antennæ of the male simple, slender, minutely ciliated, brown; palpi moderately long, straight, and porrected, tufted with long scales, but flattened at the sides, black-brown; legs normal, but the tibiæ thickly covered with black-brown scales; eyes naked, deep black, and provided with long black curled lashes at the back; head very rough, with hair-scales erect and also pointing forward from the palpi, dark brown; thorax similar in colour and in roughness, but the collar blackened, and the scales at the back gathered into a thick black tuft; abdomen mouse-colour, each segment with a whitish edging, and the first three ornamented each with a short, thick black-tipped crest; anal tuft narrow. Fore wings trigonate, very broad behind; costa faintly arched at the base and towards the apex, but flattened or even hollowed between; apex squarely angulated; hind margin below it straight, rounded off from the middle and decidedly crenulated; dorsal margin rather full, and having a small angulated raised tuft or ridge near the base; ground colour pale grey-brown, but the greater portion of the wing is occupied by a large velvety brown-black blotch which extends from the base to the second line, occupying the costa, and reaching across three-fourths of the breadth of the wing, being very sharply defined, and outwardly rather angulated; no trace of the basal or first line, but along the dorsal region from the base is a stripe of more golden-brown than the ground colour, separated from the black blotch by a fine white line; second line black, edged outwardly by a slender white line, and followed at a short distance by a series of white rings and crescents in which are placed black or dark brown dots; this evidently represents a subterminal line; from it, opposite to the angle of the great blotch, arises a thick clouded black streak which runs obliquely into the apex of the wing; orbicular stigma just visible as a deeper black dot; reniform as a similar crescent; cilia crenulated, smoky-brown dappled with darker. Hind wings broad and fully rounded, smoky-brown; central spot a small obscure black crescent; hind

margin edged by a fine black line set off by a white one; cilia pale brown with smoky clouding.

Female very different; the head and thorax smooth; abdomen shorter and more pointed; ground colour of the fore wings silvery-white; the great blotch rich chocolate, and the apical streak of the same colour, of which there is also a fine dusting along the hind margin and on the dorsal margin towards the base; dots of the subterminal line rather more distinct. Hind wings smoky yellowish-white. In both sexes this is a singularly beautiful insect.

Underside of the fore wings smoke-colour, paler towards the dorsal margin; nervures blacker; costa dusted with white and having two white dots before the apex. Hind wings smoky-white dusted all over with smoky-brown; central spot a small black streak. Body and legs smoky-brown, but the front pair of legs black, the tarsi barred with white.

Only variable in a small degree in the distinctness of the markings towards the hind margin and apex of the fore wings.

On the wing in June and the beginning of July.

LARVA much elongated and the segments deeply divided; of the abdominal prolegs three pairs are well developed, and there are indications of the remaining pair; anal prolegs extended behind; head much rounded, shining light green; body bright green, with darker green dorsal, subdorsal, and spiracular lines, the two latter rather near together; raised dots green or brown; the hairs single, rather long.

August and September, on *Vaccinium myrtillus* (whortleberry).

PUPA undescribed, in the earth. Apparently the winter is passed in this state.

The male moth is very cunning; it loves to sit in a shady spot in a holly-bush, or on the sheltered side of a tuft of

bilberry, heather, or bramble in the shadow of a tree trunk, or under the edge of the bank of a hollow wood-path among the loose roots; when disturbed it slips away in an artful manner along the shadows, to which its dark colouring so closely assimilates it, to hide again among hollies or any other thick bushes that may be available. The female is not so cautious, but sits plainly visible, head downwards, usually upon the trunk of a Scotch fir or other tree, but is there greatly protected by its wonderful resemblance to a small dead leaf of pointed ivy. It flies freely at dusk, and will come occasionally to sugar. A very local species, and mainly restricted to fir woods with an undergrowth of whortleberry, but found in Kent, Surrey, Sussex, Hants, Berks, Devon, Cornwall, Somerset, and Staffordshire, also rarely in Worcestershire and Suffolk. It is recorded in North Wales, but not in Scotland. Rather widely distributed in Ireland—common at Killarney and Kenmare in Kerry, and recorded from Waterford, Galway, Carrick on Shannon, Lough Foyle, and Derry.

Abroad its range seems to be limited to Central Europe, the temperate portions of Northern Europe, and Northern Italy.

Genus 9. **HYPENA.**

Antennæ minutely ciliated; palpi long, curved up, and densely tufted; eyes naked, without lashes; head prominently tufted in front; thorax smooth; abdomen slender, furnished with one or two small crests; legs normal; fore wings broadly trigonate; hind wings ample.

LARVÆ cylindrical, rather slender, having fourteen well developed feet; on herbaceous plants.

PUPÆ in a silken cocoon among leaves.

We have two species, easily recognised, since *H. proboscoidalis* is of nearly double the size of *H. rostralis*, and has much more pointed fore wings.

1. **H. rostralis**, *L.*—Expanse 1 to $1\frac{1}{2}$ inch. Palpi long, porrected; body slender; fore wings retuse or even truncate behind, pale brown or dull brown, with three or more central erect tufts of jet-black scales; hind wings very large, pale smoke-colour.

Antennæ of the male slender, simple, minutely ciliated, dark brown; palpi large, projecting forward, upraised, and bent up still more at the apical joint, deeply tufted but flattened at the sides, dark brown; eyes black, without lashes; head thickly and roughly tufted, the scales projecting forward over the bases of the palpi, dark brown; thorax of the same colour but smoother; fascicles small, grey-white; abdomen slender and tapering, dull grey-brown or black-brown; on the first segment is a small brown dorsal crest; anal tuft small and compressed. Fore wings somewhat oblong and truncate, moderately broad; costa gently arched; apex angulated and almost squared; hind margin below it straight and perpendicular or very faintly hollowed, then filled out and projecting, but rounded off to the anal angle; dorsal margin straight; colour whitish-brown, light brown, or pale umbreous; first line, when visible, duplicated, angulated, and indented, pale brown edged on both sides with black-brown; second line placed only just beyond the middle of the wing, rather oblique and very straight, black, usually acting as the outer margin of a blacker area of the wing than the ground colour; subterminal line a faint series of cloudy whitish dots, bordering another dark stripe or space, but this and the first line are often obsolete; from the subterminal line a cloudy black line or bar runs obliquely into the apex of the wing; orbicular stigma round, black, with a whitish margin; reniform indicated by two black dots placed perpendicularly; from them a black line runs inward, sometimes quite to the orbicular stigma; beneath this there is usually a black spot below the median nervure; all these black dots are formed of upraised scales, and the upper ones are edged with erect paler scales; extreme hind margin edged by a black

line, or a series of black lunules; cilia of the ground colour, intersected and dusted with darker. Hind wings broad and ample; hind margin very sinuous; colour pale smoky-brown; nervures faintly darker; hind margin edged with a brown line; cilia white, much clouded with smoky-brown. Female very similar, but with the body a little stouter.

Underside of the fore wings smoky-brown; costa and hind margin clouded with golden-brown; cilia dappled with the same. Hind wings brownish-white, the front half dusted with brown and black, and showing a short portion of a transverse smoky-black stripe; extreme hind margin edged with black lunules; cilia smoky-white. Body pale brown, dusted with black; legs long, pale brown; darker brown in front.

Variable in the ground colour from whitish-brown to dull smoky-umbreous, much more so in the markings. Very often the fore wings appear to be sharply divided transversely at the second line—all outside it being far paler than the inner area; when this is the case the outer area is often very prettily waved with parallel lines of cloudy pale brown; in other instances it is very uniform in colour, and sometimes even the black apical streak is obscured or absent. The same occurs to the black streak between the stigmata, and even to a portion of the raised black dots; but on the other hand, when there is no dividing line, and the whole area of the wing is umbreous, these dots stand most conspicuously upright, and render the species unmistakable. This happens also when the colouring is changed to longitudinal stripes of brown clouding, and all other markings have disappeared. All intermediate forms are found, and it is difficult in words to do justice to the mutations of this interesting insect.

On the wing in August and September, and after hybernation from April till June.

LARVA about an inch long, and slender in proportion;

head of the width of the second but narrower than the third segment, its lobes rounded, green tinged with yellow and plentifully dotted with black; body widest in the middle, attenuated very gradually to the anal extremity; prolegs eight in number, the segments from the fifth to the seventh arched in walking; skin soft and smooth; tubercles slightly raised, and from each of them springs a single short inconspicuous hair; colour bright grass-green—exactly the same colour indeed as the underside of the hop leaves upon which it feeds—a darker green pulsating vessel showing clearly through the skin forms the dorsal line; subdorsal lines clear white; spiracular lines also white, but much interrupted and less distinct; tubercles and spiracles black; segmental divisions yellow, but scarcely noticeable; ventral surface, legs and prolegs all of the same bright green. (G. T. Porritt.)

June and the beginning of July, on Hop (*Humulus lupulus*). Hofmann states that a second generation feeds on nettle and hop in August and September, but I feel sure that this is not the case here. A very active larva, darting backwards or forwards with equal facility. During the day it lies closely along the underside of the hop leaf against the midrib, where it is much protected by its colour.

PUPA about five-eighths of an inch long; of ordinary *Noctua* shape; smooth and polished; the ribbed antenna-cases prominent and reaching quite to the end of the wing sheaths; colour rich mahogany brown. In a cocoon of white silk among the leaves, so nearly transparent that the pupa can be distinctly seen within it. (G. T. Porritt.)

The moth hides during the day near to the ground among rocks, or stones in rockeries, under thatch or rafters, under faggots, or other wood, or any garden rubbish; and if disturbed dashes instantly away to another resting place, sometimes within a few feet and quite visibly, yet looking, while it remains still, like a mere bit of dead and crumpled leaf.

At dusk it flies rather gently, often about gardens and lanes and the borders of woods; and will come to sugar, ivy-bloom and the blossoms of heather. It retires rather early, to hybernate under the roof of a shed or disused building, or under a thatch, ledge, or any such sheltered covering, and does not become torpid except during severe frost, but moves about in its hiding place, yet does not seem to fly at all until the spring. It appears to be especially attached to suburban gardens, and to the adjacent lanes, and is still tolerably common in the London squares and outskirts; also is found more or less plentifully in all the Southern and Eastern Counties of England; all the Western, except that it is scarce in Cornwall; in the southern portion of the Midlands, and in some parts of Yorkshire; but I have no record for Wales; for Scotland only one in the extreme South, in the Tweed district; and no certain locality in Ireland.

Abroad it seems to be found throughout Central Europe, the temperate portions of Northern Europe, Spain, Italy, Corsica, Northern Turkey, Southern Russia, Eastern Siberia, Asia Minor, and the mountainous regions of Central Asia.

2. *H. proboscidalis*, L.—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Palpi porrected, very long; body not stout; fore wings very broad, pointed and somewhat trigonate, velvety-brown with two red-brown transverse lines, and a wavy dotted line beyond. Hind wings ample, pale smoke-colour.

Antennæ of the male slender, simple, faintly ciliated, light brown; palpi long, porrected, flatly tufted and compressed at the sides, apical joint slightly bent upward; eyes brown; head brown, rather smooth, but the scales long, laid down, and pointed forwards in an angulated prostrate tuft which conceals the bases of the palpi; thorax rather narrow, smooth, brown; fascicles small and short, smoky-white; abdomen rather slender, smooth, pale brown, each segment faintly edged with white, and the first and second sometimes decorated each with a very small brown dorsal crest, which.

however, is either frequently wanting, or exceedingly evanescent; anal tuft small. Fore wings very broad, pointed and trigonate; costa faintly arched toward the base and the apex, very straight between; apex pointed and rather produced; hind margin beneath it a little hollowed, then filled out and expanded in the middle, but oblique towards the anal angle, which is prominent; dorsal margin very gently rounded, somewhat ciliated and full towards the base; colour pale brown abundantly dusted with purple-brown; first line dark purple-brown or red-brown, curved and a little indented; second line of the same colour, broadly shaded off inwardly, oblique, rather direct, and placed in the middle of the wing; the inward shading often takes the form of a narrow, deep brown central transverse stripe; subterminal line a faint dark brown shade, sinuous but complete, edged, especially above the middle, with white and black dots; orbicular stigma sometimes indicated by a brown dot, reniform more frequently by a small black-brown cloud; below the apex the concave portion of the hind marginal space is clouded with dark brown; cilia concolorous. Hind wings large, rounded behind, pale smoky-brown; extreme margin and cilia a little darker. Female extremely similar, but its body is rather stouter and more pointed.

Underside of the fore wings smoky-brown, clouded along the costa with pale brown, and having before the apex two black-brown commencements of transverse stripes which do not extend further. Hind wings pale golden-brown dusted with dark brown, especially so along the hind marginal region; central spot black; beyond it is a cloudy dark brown transverse stripe. Body and legs pale smoky-brown.

Hardly variable except in the depth of the ground colour, of the stripe along the second line, and of the hind marginal space, from light umbreous with a brown stripe and shading, or with very little indication of either, to purplish-brown with bands much deeper in colour.

On the wing in June and July; but abroad apparently in

May, and as a second generation in July and August. In this country this second emergence is rare and extremely casual, only occurring in long warm summers.

LARVA elongated, not thick, tapering off behind; the anal feet a little extended; head rounded, yellow-brown; body grass-green with deep yellow divisions to the segments; dorsal line darker; on the sides are interrupted yellower longitudinal lines; raised dots pale, each with a stiff brown hair; these hairs point in different directions, so that they cross or touch at their tips when the creature moves; prolegs greenish-white, the last two pairs well developed and long, the others small. When young, paler green with the head dotted with dark green, and a third pair of prolegs well developed; the raised dots black and very distinct, in a row below the spiracles; sometimes there are indications of whitish subdorsal and spiracular lines.

Apparently from August till May upon common stinging-nettle, living within a spun-together leaf. But there is some obscurity even as to the food of this species, although it is only found among nettles. Hofmann says that it feeds upon low-growing plants, especially nettle and hop; but Treitschke adds to nettle (*Urtica urens*), *Plantago lanceolata* and *Egopodium podagraria*. Possibly when its favourite nettles are cut down, as frequently happens, it will feed upon low plants growing among them.

PUPA elongated and having long wing-covers; spiracles distinctly visible; anal segment provided, apparently, with only one spike; colour dark red-brown. In a whitish web among spun-together leaves. (Treitschke.)

The moth inhabits beds of nettles, especially those which grow along ditch banks or among thick undergrowth, and sits forming a broad triangle, head downwards, under a nettle leaf. It is very easily disturbed, but sneaks away, and strives to hide itself among the thickest masses, often close to the

ground. At dusk it flies in a very conspicuous manner, but generally keeps near to the nettle-beds. Plentiful in lanes, road-sides, and all waste spots in which nettles are permitted to grow, almost all over England, but apparently less so in the north-west. So far as I know not abundant in Wales—it certainly was not so in Pembrokeshire. Common in the eastern portions of Scotland, to Forres and elsewhere in Moray, though somewhat local; also in the west to Dumbartonshire. In Ireland everywhere abundant. Abroad it is common over nearly the whole of Europe, Asia Minor, Tartary and the mountainous regions of Central Asia.

[*H. obsitalis*, Hüb.—A pretty species of about the size and shape of *H. rostralis*, or often smaller; the fore wings similarly truncate or retuse, usually of some shade of brown—light brown, grey-brown, dull brown, or dark umbreous—with a triangular yellow or grey-white blotch on the costa, running into the apex, and before it a perpendicular partial stripe of the same colour; the rest of the wing rather clouded or shaded with paler colour, especially so along the dorsal margin; but very variable, sometimes having a large and somewhat triangular darker blotch from the costa occupying the middle portion of the wing, and nearly always showing some trace of this.

On the wing at the end of July.

The larva is said to feed in May upon pellitory (*Parietaria officinalis*); and the moth is reported to have a habit of hiding in dark corners.

A single example of this species was captured on the 21st September 1884 at rest on the door-jamb, in the flower-garden at Bloxworth Rectory, Dorset, by the Rev. Octavins Pickard-Cambridge. This is the only instance of which I have any knowledge, of its occurrence in these Islands, and although the species has, on account of this capture, been introduced into British Lists, there seems little reason to believe that the specimen was other than an accidental importation, at some stage of life, from the Continent. It is

essentially a southern species and has an extensive range through Southern Europe, Syria, Armenia, Asia Minor, Cyprus, Madeira, the Canaries, Egypt, Morocco, and Algiers, and is very common in South Africa.]

Genus 10. **RIVULA.**

Antennæ short, simple, thickly ciliated; palpi not very long, triangularly tufted, porrected; eyes naked, without lashes; thorax slender, smooth, with long shoulder-lappets; abdomen slender, smooth, tapering, not crested; fore wings small, bluntly triangular, very narrow at the base; hind wings proportionately rather large.

We have but one species.

1. **R. sericealis**, Scop.—Expanse $\frac{3}{4}$ to $\frac{7}{8}$ inch. Palpi shortly triangular, body slender; fore wings trigonate, straw colour at the base, shading off to brownish-yellow behind; reniform stigma a black-brown spot; hind wings smoky-white; legs normal but long.

Antennæ of the male simple, thickly but softly ciliated, light purple brown; palpi not very long, triangularly tufted, depressed, dull yellow; eyes black; head rather smooth, white; collar divided into two flaps, yellowish-white; remainder of the thorax narrow, smooth, dull yellow; fascicles pale yellow; abdomen slender, tapering, smooth, yellowish-white, with distinct lateral tufts; anal tuft narrow and pointed. Fore wings short and rather truncate, but triangular; costa very faintly arched; apex bluntly angulated; hind margin beneath it straight and but little oblique, rounded off however below the middle; dorsal margin gracefully curved; colour soft dull yellow, palest at the base, tinged along the hind margin with reddish-brown; there is usually no trace of transverse lines, but in some individuals these are visible, slender, cloudy and much indented, the first somewhat perpendicular but broadly angulated, the second very

oblique and curved, returning toward the costa; between them is a black cloudy spot containing two blacker dots, and representing the reniform stigma; often this throws off a faint smoky streak to the first line. Where these lines are visible there is usually darker dull purplish-brown clouding towards the hind margin; cilia concolorous. Hind wings rather long, with the hind margin sinuous; white or smoky-white with an abundant dusting of purplish-brown, and a general superficial purplish gloss; nervures tinged with brown; cilia white. Female often almost devoid of the darker clouding of the fore wings, which are therefore yellower, but even with this brighter colour there is often a narrow purplish-brown shade along the hind margin; hind wings whiter; body short but hardly thicker.

Underside of the fore wings purplish-brown; costal and apical regions fulvous-yellow; reniform stigma indicated by a black cloud. Hind wings yellowish-white; beyond the middle is an indistinct, partial, dusted, tawny transverse streak. Body and legs yellow-brown.

Such variation as exists in this species is in the direction already indicated—the presence or absence of transverse lines, and of the dark shading—and these are not wholly sexual, since males are not infrequently quite yellow so far as the fore wings are concerned; and occasionally a female is found having the transverse lines and the dark shading very distinctly visible. Colonel Partridge has an example taken near Enniskillen, Ireland, in which the yellow colour is wholly obscured by smoky clouding.

On the wing from the end of June till August.

LARVA cylindrical, of moderate stoutness, the three hinder segments slightly tapering, and the anal prolegs extended backwards; head rounded, greenish-drab, with dusky dots and hairs; body rather velvety, bright green, the colour deepest on the back and down to the spiracles, the tracheæ showing faintly through the skin as a paler thread; subdorsal stripes

white, commencing on the second segment, continue of the same width throughout, but draw rather nearer to each other as they approach the thirteenth; the outer edge of these is straight, but the inner concave on every segment, so that the green ground of the back appears as a series of broad ovals with a darker green dorsal line running through them; segmental folds greenish-yellow; spiracles round, flesh-colour, faintly edged with black; raised dots glossy green, each bearing on its summit a dusky dot, from which springs a rather long rough hair, which, when highly magnified, is seen to be barbed; undersurface pale green; all the legs and prolegs green; the latter fringed with fine blackish hooks.

When newly hatched it is quite hairy, the head whitish-brown, with dark mouth and ocelli; a dark grey internal vessel can be but indistinctly discerned through the skin of the body. As it grows its dorsal region becomes green, then dark purplish-red from the colour of the internal vessel, but this is interrupted on the tenth segment. After the second moult the double dorsal and whitish subdorsal lines begin to appear, the head is pale green with minute dusky specks, and each raised spot has a similar glossy dot bearing a long black hair. These colours are maintained until hybernation, which takes place on a little foothold of silk upon the food-plant; but afterwards the green colour re-asserts itself, and the adult colouring is gradually assumed. (Adapted from Buckler.)

August till May on *Brachypodium sylvaticum*, and probably other grasses, since *Phalaris arundinacea* has certainly been accepted as a substitute; eating out notches in the sides of the grass-blades, or when more nearly full-grown eating them obliquely through.

PUPA of ordinary form, the wing-covers well developed, with their nervures in strong relief; abdominal segments smooth and very slightly defined; anal tip furnished with several minute, curly-tipped, shiny bristles, which are thrust

into the silk of its cocoon, and hold fast; general colour green, having beyond the thorax the two white subdorsal stripes which marked the larva; these gradually fade as it matures, and the wing-covers turn pale, and ultimately quite dingy before the perfect insect emerges. In an oval cocoon formed by drawing together a portion of the grass-blade and partially lining it with silk, one or two threads of silk are also passed loosely across the back, forming a stay or cincture, to secure all in position, and a few more over the hinder segments as further security; the uncut portion of the top edge of the leaf is drawn down obliquely over the hollow, and partially hides the occupant from view, though the colour of larva and of pupa assimilating with that of the grass is no doubt a source of protection. (W. Buckler.)

The moth frequents marshes, damp woodsides and rides, the margins of ponds, moist lanes where long grass grows in the ditches, and particularly the springs and moist spots on open commons and heaths where the grass and herbage are rank. Here it is easily disturbed in the daytime, but is not timid, and settles again close by, hanging to a grass-blade or leaf in the manner of the *Pyralites*, to which group in habits it closely assimilates. In the early twilight it flits lazily about in the same places, and is never very conspicuous. Probably its flight is continued into the night, but of this I am not certain. Common in such places in many parts of England, excepting, apparently, the Midland counties, but scarcer in the north; formerly common in lanes in the outskirts of London, whence it has now almost disappeared. Probably widely distributed in Wales, since I found it commonly in marshy spots in Pembrokeshire. Abundant everywhere in Ireland, but in Scotland very local, and apparently confined to the Solway and Clyde districts, and to Arran. Abroad it is found all over Continental Europe except the Polar districts, also in Syria and Tartary.

Family 7. **BREPHIDES.**

Antennæ of the males pectinated, or toothed like a saw; palpi small, but covered thickly with bristles projecting forwards; ocelli absent; eyes naked; body slender, bristly; legs also hairy, the femora shorter than the tibiæ; fore wings oblong, very blunt behind, and the costa nearly straight; hind wings almost equally long, narrow, and scarcely folded when at rest.

LARVÆ half-loopers, the first two pairs of ventral prolegs being short and almost useless.

PUPE long and very cylindrical.

This family seems to contain but a single genus, and is somewhat closely allied to the *Geometrina*.

Genus 1. **BREPHOS.**

Antennæ pectinated or notched, not ciliated; eyes naked, without lashes, but much hidden by the thick mass of erect hairs which covers the palpi and head; thorax and abdomen slender and hairy; fore wings oblong-trigonal, blunt, thick in texture; hind wings narrow, long, with straight dorsal margin; vein 5 of the fore wings in the middle of the cross-bar, in the hind wings much below it, but complete and full at the margin.

We have but two species, very similar, but in *B. notha* the antennæ of the male are pectinated, and the fore wings triangular; in *B. parthenias* they are more elongated, and the antennæ only ciliated.

1. **B. parthenias**, *L.*—Expanse $1\frac{1}{4}$ to $1\frac{1}{2}$ inch. Fore wings long, blunt behind, reddish-brown banded with pale brown and greyish-white. Hind wings long and narrow, orange-red with a large dark brown basal blotch and black margin; antennæ notched or almost simple.

Antennæ of the male short and rather evenly thick, faintly serrated and ciliated, black-brown; palpi short and curled up, but their shape quite hidden by an abundance of stiff black hairs pointing forwards and upwards, grey-black; head and thorax very rough with loose erect hair-scales mixed with hairs, black-brown, the latter narrow; abdomen almost as thick as the thorax, yet not stout, very even in breadth, black, but covered with fine downy grey-brown hairs; anal tuft narrow, pale brown mixed with grey-black. Fore wings rather long, oblong-trigonal, broad behind; costa almost straight or very faintly arched; apex bluntly rounded; hind margin very gently curved, hardly oblique, and the anal angle prominent; dorsal margin straight; dull tawny-brown, dusted with black, and on emergence with blue-black, which last appears to be shaken off in flight; first line oblique, thick, direct yet much indented, black; second line obscure, rather erect, much indented, black shaded off inwardly; subterminal line nearly parallel with it, but obscure, pale brown or whitish-brown, inwardly edged with small cloudy black triangular spots, which often, however are but partially represented; reniform stigma indicated by an ovate black spot with a bluish centre; joined to it on the inner side is a triangular white costal blotch or spot; beyond this, near the apex of the wing, are often two smaller cloudy white spots; cilia bluish-black dashed with white. Hind wings rather elongated and narrow, the costal margin more straight than usual and the apex more angulated, but rounded behind, orange-fulvous with a large brown-black squared blotch occupying the dorsal half of the wing to beyond the middle, where it often unites with a similar stripe crossing the wing from the costa; along the hind margin is an irregular indented black stripe; cilia similar, shaded and dashed with yellowish-white. Antennæ of the female simple and more slender; fore wings a very little narrower and usually having less black dusting; abdomen decidedly thicker and very blunt.

Underside rich orange-tawny with some white clouding along the costal edges of all the wings ; a square spot beyond the middle of the fore wings, and a slender transverse stripe from it, are deep black. and the apical space dull black ; in the hind wings the black markings of the upper side are repeated. Body and legs black, but covered with pale ashy down.

Variation in the colour of the fore wings is not unusual, from brownish-tawny and rusty-brown to blackish-brown, but in the last case usually with a hoary dusting and the dark colour much restricted to the anterior half. In the collection of Mr. S. J. Capper is an example having the fore wings marbled almost all over with orange-brown except at the margins ; he has also a male having the hind wings yellow. One in Dr. Mason's collection has all the middle and apical areas of the fore wings broadly clouded with white and pale brown ; and a female in that of Mr. P. M. Bright has a broad white central band. In the white clouding there is often considerable variation, since an extension halfway across the fore wings is by no means rare, while in some individuals it is restricted to two white costal triangles. In the hind wings the black-brown stripe from the costa, uniting with the great dorsal brown blotch, is often broken into spots, or partially broken and swollen into one large round or lunate spot, or reduced into this one spot only, and I have one specimen in which this stripe is wholly absent. Occasionally the black marginal band throws out a broad extension as a black blotch which almost crosses the orange-red space. Mr. C. W. Dale possesses a specimen in which the fore and hind wings are entirely black.

On the wing in March and April.

LARVA slender, cylindrical, and extremely even in thickness ; head rounded, semi-translucent, pale green ; body dull soft green, exactly the colour of a birch-leaf ; dorsal line slender, double, white ; subdorsal lines quite similar, so that

six parallel slender white lines extend the whole length of the body ; spiracular line broader, white, placed on a narrow raised ridge or wrinkling of the skin ; spiracles black ; usual raised dots minute, white, having very small straight bristles ; undersurface and prolegs paler green ; legs still paler and tipped with yellow-green, rather large and strong ; anal and third pair of prolegs also very robust, the other three pairs smaller and decreasing in size to the first, also much less in use, since the mode of walking is to form a complete loop like a *Geometra*. Occasionally the green ground colour is replaced by brown. Very active and lively, feeding eagerly by day ; by no means disturbed even by examination and description.

April and May or the beginning of June on birch, feeding when young in preference upon the catkins, later upon the leaves.

PUPA long, narrow, and very uniformly cylindrical, leg and antenna-covers faintly raised above the generally smooth surface and, with the wing-covers minutely sculptured in very fine transverse incised lines, which render these portions rather dull ; head a rounded projecting knob, eyes and mouth-cover wrinkled ; dorsal surface also wrinkled, and ridged at the segments ; abdominal segments edged on both margins by strong sharp ridges, the incisions between deeply incised and angulated ; the front ridges deeply pitted ; anal segments smooth and thick, but rounded, and furnished with a small rounded knob as a cremaster, with two short spikes widely divergent and bent back ; whole surface moderately shining, pitchy brown, bright in the smooth portions. In a very neatly excavated chamber in the substance of soft bark, the chamber being at right angles with the entrance hole, across which is built a silken diaphragm.

In this condition through the winter.

The male moth flies in the sunshine with great activity at thirty to fifty feet from the ground, sometimes higher, or

even over the trees, often descending lower to near the ground; sometimes also attracted by a bush of blooming sallow, or even occasionally enticed to settle quite down at the wet margin of a boggy or sandy pool, and there imbibe the moisture, raising its wings and turning about. Major Ficklin has seen it go for this purpose quite into the shallow water and sandy mud. This even seems to be the case sometimes in damp wood paths, or it will occasionally bask in the sun upon the ground or on a fence. If a cloud comes over it settles down at once on a birch twig, clasping it closely with steeply inclined wings. The female sits in the same manner and is hardly ever seen to fly, but looks precisely like an old dead leaf twisted round a twig. Thus it is very difficult to discover, and is more likely to be obtained by beating the trees than by examining them. The capture of a female, however, with judicious management will sometimes bring plenty of males within reach. These last when flying are full of dodges, dashing upward, downward, especially backward, to escape when pursued, and it is particularly exasperating, when one makes a rush in pursuit of a specimen which has flown rather low, to find suddenly that it has turned behind its pursuer, and is making off safely in the opposite direction. Its favourite haunts are boggy heaths where birch grows freely, and in such places, as well as along the edges of birch woods, it may often be seen flying in abundance in the sunshine at a safe height, on the side of the trees most sheltered from the wind. Plentiful in such suitable places in Surrey, Kent, Sussex, Hants, Berks; Savernake Forest, Wilts; and found in Somersetshire, Gloucestershire, Middlesex, Hunts, Cambs, Essex, Suffolk, Norfolk; Sherwood Forest, Notts; and very locally in Warwickshire, Staffordshire, Derbyshire, Worcestershire, Cheshire, Lancashire, Yorkshire and Lincolnshire, but apparently not noticed further north in England. In Wales it is recorded in Glamorganshire, but must surely exist in many other parts. In Scotland it has been found in Aberdeenshire and

Kincardineshire, and in plenty in some of the wooded districts of Moray. In Ireland it seems to have been recorded only in Westmeath. Abroad its range is through Central and Northern Europe, Piedmont. Southern and Eastern Russia, Eastern Siberia, the mountainous regions of Central Asia, and Labrador.

2. **B. notha**, *Hüb.*.—Expanse $1\frac{1}{8}$ to $1\frac{3}{8}$ inch. Antennæ pectinated. Fore wings triangular, grey-brown, banded with black-brown; hind wings orange-red with markings as in the last species.

Antennæ of the male shortly but distinctly pectinated with almost naked oblique solid teeth which are thickened at their tips, black; palpi short, black, and with the head, almost hidden by abundant stiff projecting grey-brown hairs. thorax narrow, similarly black and hairy; abdomen slender, rather hairy, black-brown; anal tuft small. Fore wings almost triangular, shorter than in the last species, broad behind; costa faintly arched, almost straight; apex angulated; hind margin rounded and full, hardly oblique, the anal angle well developed; dorsal margin straight; colour grey-brown or blackish-brown with a subdued undertone of tawny; first line oblique, black, very little indented, faintly edged inwardly with dusky white; and very often outwardly by a broad oblique straight band of the dark ground colour; and this by an even broader parallel stripe of pale grey or brownish-grey; second line also black, rather erect, a little indented and bent outwardly in rather larger angles in its upper portion, edged outside with a white or pale brown thread; subterminal line very distinct, broadly black, shaded off inwardly, and bordered outside with a white line which is dusted with black; reniform stigma completely margined with black; beyond the second line is a white crescent on the costa, and near the apex a whiter costal dot; cilia black-brown dusted with white. Hind wings rather squared behind, rich orange-fulvous; from the base the dorsal half of the wing is occupied

by a large black blotch covered with golden-yellow hairs, and this is united with a broken black transverse stripe from the costa; hind margin bordered by an irregular, indented, black stripe; cilia black, mixed with yellowish-white. The female has slender simple antennae, the fore wings shorter and a little narrower, and the abdomen rather stout; the ground colour of its fore wings is often paler, especially in a transverse band of greyish-white at the base and another beyond the middle.

Underside of the fore wings orange-tawny; on the costa beyond the middle is a black blotch or produced spot, followed by a white cloud on the costa, and this by a broad dull black blotch which occupies the apical region, and is continued along the hind margin. Hind wings orange-tawny, the black markings as on the upper side, except that the central black transverse stripe is more complete. Body and legs black, covered with a yellowish down.

Variation in this species is not great, and shows itself mainly in the direction of elimination of the whitish-grey or dusky stripes, which then are more or less replaced by the ground colour, or even by a more purplish-brown tone thereof, some specimens having the fore wings almost unicolorous; on the other hand, very occasional specimens have the grey bands hoary, or even almost white. Of this last form Major A. Ficklin possesses a beautiful example.

On the wing in April.

LARVA about an inch in length, not very stout, cylindrical and almost of uniform bulk throughout; head full and rounded, green or yellow-green; spotted, as is the second segment, with black; the two front pairs of ventral legs are much less developed than the next two pairs, and the hindmost are splayed laterally; beneath the anal flap is a small point with a tubercle on each side of it; the segments are plump and well defined; ground colour a pale subdued tint

of green, or else bright velvety yellowish-green; the dorsal vessel a rather deeper tint of the same, edged with fine lines of pale greenish-yellow; the subdorsal fine line is yellow, and between it and the spiracles runs another such fine line which passes through a broad black lateral stripe, dividing it into two, in some specimens completely, in others only partially; spiracles white, delicately outlined with black, and beneath them is a broad stripe of pale yellow or whitish-yellow; undersurface and legs paler green than the back. In one individual a short tapering black streak issued at the end of each segment for half its length forwards, as an edge to the subdorsal line; but these streaks appeared only on the fifth to twelfth segments. The black marks on the head and second segment appear to be constant and characteristic of this species; they may therefore be more minutely described as follows: A broad irregular blotch down the front of each lobe, forked at the side, a round spot on the face between them, and two pairs (sometimes more) of black dots on the second segment. The pale lines of the back are absent from the second segment and from the anal flap; the anterior legs are generally spotted with black.

A variety is of a dingy, rather olive-brown; lines pale pinkish-grey; with only the usual black marks on the head, second segment and anterior legs.

The young larva up to half an inch in length is very dingy and nearly black, but bears some exceedingly fine pale drab longitudinal lines; after moulting and when about three-quarters of an inch in length, it becomes less like the larva of a *Noctua* in form than it was before, and more like a *Geometra*, both in form and manner of progression. Its colour is now a delicate green, inclining in some instances to glaucous; the longitudinal lines and segmental folds become whitish-yellow; the head and second segment spotted with black; the growth now is rapid; in some individuals black spots appear on the sides, in a day or two

developing into stripes ; but in others no fresh spots appear. (W. Buckler.)

May and June on aspen (*Populus tremula*), feeding upon the leaves, spinning them together flat-wise for concealment.

PUPA half an inch long, narrow, uniformly cylindrical to half the length of the abdomen, whence it rather rapidly tapers ; but the anal segment is thick and bluntly rounded off behind, bearing a curious short, broad, flattened cremaster like the head of a hatchet, from the two outer angles of which spring two short spikes standing straight out *sideways*; head a little flattened in front, antenna-cases showing the cross lines of the joints, but limb-covers closely packed and smooth ; wing-covers also smooth, slightly ribbed, but scarcely sculptured, shining ; first three abdominal segments furnished in front with a raised ridge which is much punctured ; remaining surface smooth and brilliantly glossy ; colour rich red-brown. In a cylindrical chamber or tunnel gnawed in the substance of soft bark or wood ; without cocoon, but the entrance closed with silk mixed with gnawed fragments of wood.

In this condition through the winter, and it has been known to remain unchanged for more than one year.

The moth, the male especially, flies in a lively manner, in the sunshine, at a good height, among aspens and over undergrowth. When inclined to rest, it does so on the higher twigs, shutting its wings closely and flatly down, the hind wings quite concealed ; but is easily disturbed and induced to fly again. The female is more inactive. Whether there is any flight during the night does not seem to be known. A very local species, confined to open woods, and places with scattered aspen trees. Found in Kent, Essex, Sussex, Surrey, Middlesex, Dorset, Wilts, Gloucestershire, Cambridgeshire, Suffolk, and Norfolk, also rarely in the Trench Woods,

Worcestershire, and in Yorkshire. In Wales in Monmouthshire ; and in Scotland in the Altyre Woods, Moray. So far as I know not found elsewhere in the British Isles. Abroad it extends over the greater part of Central Europe, Southern Sweden, Southern Russia, and Northern Italy.

Group 1. *GEOMETRINA*.

This is also an extensive group of species. It is not very closely allied to the last, but seems to run in other lines, with perhaps, in some degree, a closer alliance to the *Bombycina*. The arrangement usually followed in this country—that of M. Guenée, as adopted by Mr. Stainton in his “Manual”—seems to be open to a criticism similar to that to which his arrangement of the *Noctuina* is exposed, of a separation into families of which the structural characters are insufficient, or of merely generic value. In this respect that followed by the later German authors appears more satisfactory, though here they mass together in single genera large numbers of species which seem to be more reasonably placed in smaller ones. We miss in the present group the extensive series of structural characters so useful in the subdivision of the *Noctuina*, and are compelled to place more reliance on those which remain. For instance, the eyes in the present group, although usually large and prominent, are, I think, always devoid of the covering of minute upright bristles found in so many of the species of the previous; and there is little, if any, indication, in the vast majority of the species, of the bordering rows of bristles which I have denominated eye-lashes. Where the eyes are less prominent—in stouter species—they are often obscured by dense hair-scales which project from the head. The collar is far less conspicuous—indeed, between it and the head a small transverse ridge is commonly interposed—or has become noticeable through the extension forward of the head. The top crest, so conspicuous in many *Noctuina*, seems to be invariably absent; and the back crest, where visible, is usually a mere short blunt undivided tuft of scales extending across the back of the thorax. The abdomen, though often possessing the lateral tufts, and always the anal, is commonly quite devoid of any indication of dorsal crests; and even where these are present they are usually

very small, and often prostrate, or merely suggested at the edge of each segment on the dorsal ridge. The tufts of scales from the sides of the thorax over the base of the abdomen, which I have denominated the fascicles, are usually equally obscure, if not absent.

The fore wings are nearly always proportionately broader and more trigonate, and it is in them that a most valuable character is found separating this from the previous group—the nervure known as vein 5 of the *fore* wings always arising at the middle, or above the middle, of the cross-bar which closes the discal cell. The hind wings are usually very little folded, yet the usual folds are quite strongly indicated, and that along the line of vein 5 so much so as to suggest a complete nervure from the base through the middle of the discal cell to the margin, where actually no such nervure exists. The peculiarities in venuration in these wings furnish characters which appear suitable for dividing the group into families. As a rule, the insects of this group are weak in structure, their bodies—thorax included—being slender, and the wings thin in texture, and suited for their habit of lying flat against some protecting solid surface, such as a wall, or tree-trunk, or the underside of a leaf.

The terms hitherto used in describing the markings are still applicable; but the basal line is very often only the outer edge of a well-defined basal blotch, while the first and second lines are equally the inner and outer margins of a broad central band; but the subterminal line is, when visible, more frequently broken up into a series of very irregular, paler or darker, clouds or spots. The central shade, as found in so many of the *Noctuina*, is here very commonly more definite and more distinct, forming a narrow stripe, or a fine line, quite as well defined as the normal lines, while for it is substituted, in a multitude of species, the broad dark central band. The three stigmata are absent, except that very often the position of the reniform at the end of the discal cell is occupied by a pale or dark, or commonly black, spot, dot, or

streak, which it is convenient to call the discal spot. The markings of the hind wings are usually few or indistinct, but the apex of the discal cell is ordinarily furnished with a central dark spot or lunule, as in the *Noctuina*, and this is commonly much more distinct on the underside.

The antennæ are extremely various, either strongly pectinated with short thick teeth, or with long slender curved teeth, or even plumose; in some genera, pectinated for only a part of their length, the apical portion being simple; or they are notched, or ciliated in tufts, or merely simple and ciliated throughout, or even apparently naked, though there are few in which a faint silky pubescence may not be detected, along the front, by the aid of a good lens. Always threadlike in the female.

LARVÆ almost invariably devoid of the first three pairs of prolegs, or having them imperfectly developed; looping strongly in progression, and much given to extending themselves stiffly, like twigs, when at rest, supported only by the two hinder pairs of prolegs.

I have again to acknowledge the assistance derived from Sir George Hampson's work on the Lepidoptera of India in working out the families.

Family 1. **BOARMIDÆ.**

Antennæ various, often wholly or partially pectinated; palpi short; tongue well developed; thorax rather rough, with long scales, sometimes stout and very shaggy; abdomen tapering or slender, without crests; fore wings usually broad; hind wings ample, *cell 5 obsolete*, no indication thereof in the form of the hind margin.

LARVÆ usually twig-like, feeding openly on trees, shrubs, or low-growing plants.

PUPE rather sharply tapering behind, usually in a silken cocoon.

Genus 1. **OURAPTERYX.**

Antennæ simple; palpi short; thorax broad, rather smoothly covered with long loose hair-scales; abdomen more slender; fore wings broad, pointed; hind wings with a distinct tail in the middle of the hind margin.

We have but one species.

1. **O. sambucata**, *L.*—Expanse 2 to $2\frac{1}{4}$ inches. Fore wings broad, pointed; hind wings tailed, a brown spot on each side of the tail; general colour pale primrose-yellow or yellowish-white, with slender transverse olive-yellow stripes.

Antennæ of the male simple, naked, yellow in front, white at the back; palpi small, tawny; face purple-brown, the scales smoothed down, but edged above by a transverse furrow close under the antennæ; top of the head pale primrose-yellow; thorax broad, of the same colour, the scales upon the shoulder-lappets long and loose, but lying well back; abdomen white; lateral tufts small; anal tuft spreading, all faintly tinged with yellow. Fore wings broad and somewhat trigonate; costa nearly straight, but arched toward the apex, which is sharply angulated; hind margin below it faintly hollowed and thence rather straight and oblique; anal angle well formed; dorsal margin a little rounded and strongly ciliated; texture very silky; pale primrose-yellow fading to white; first and second lines rather near together and to the middle of the wings, perpendicular and nearly straight, not sharply defined, olive-yellow; between them, at the end of the discal cell, is a perpendicular streak of the same colour; cilia short, pale olive-yellow. Hind wings yellowish-white; long and rather narrow, the hind margin sloping off to a conspicuous angulated tail, on each side of which is a small fulvous spot; down the middle of the wing is a perpendicular olive-yellow line; cilia fulvous, shading off to yellowish-white

near the anal angle, and to white along the front margin. Female larger. abdomen stouter, otherwise accurately similar.

Underside of the fore wings pale primrose-yellow, except the dorsal region, which is broadly silky white; perpendicular lines of the upper side faintly perceptible. Hind wings yellowish-white; nervures rather thickened and very visible. Body and legs nearly white.

Usually constant in colour and markings, but there is in Mr. Sydney Webb's collection a specimen in which the first line is removed to the middle of the fore wings, and the second line is so placed immediately beyond it that the clouding of the two coalesces, and forms a narrow perpendicular yellow-olive band. Mr. Percy Bright has one similar, and having the usual stripe upon the hind wings drawn back nearly to the base. Specimens occur, very rarely, in which the two lines of the fore wings are placed extremely widely apart; and others in which the tips of the fore wings are quite falcate, or in which the hind margin is rather expanded.

On the wing at the end of June and in July, but in the South of Scotland extending into August. Occasionally, though rarely, individuals of an extremely partial second generation are met with, near London, in September or October. I have myself taken it in the latter month.

LARVA very long and slender; fourth segment swollen; seventh with lateral bud-like protuberances; ninth and twelfth slightly humped, the former especially; two parallel points project from the anal segment; sides puckered, head very flat, almost squared in front; dull purplish-brown; legs much curved and sprawling outwards; general colour yellowish-brown, reddish-brown, clay-brown, or putty-colour, often shaded and marbled with dull purple, particularly upon the protuberances; undersurface with numerous longitudinal whitish lines and grey indistinct hairs. (C. Fenn.)

August to June on ivy, hawthorn, blackthorn, elder, bramble, even larch, and various other trees and plants. In gardens it will eat scarlet geranium, indeed is not very particular as to its food, and in confinement has been induced to feed on holly. When walking it has a tremulous habit, as though tottering, and it assumes very strange attitudes when at rest. Upon its favourite food, the ivy, it poses in various positions all exactly resembling the different forms of twigs of that plant, balancing itself at the same time by a strong silken thread from its mouth; indeed it cannot easily be distinguished from one of these twigs except by the sense of touch. Its hybernation is imperfect, since it will feed whenever the weather is mild, and thus in some seasons becomes full grown very early. It feeds principally at night.

PUPA slender and much elongated, bluntly flattened at the head, the cover of the palpi slightly projecting in front; at the back of the head is a curious raised ridge; covers of the wings, antennæ, and limbs most beautifully stippled all over with minute irregular, faintly incised, mossy, black lines on a pale brown ground, the lines of the limbs, the edges of the antennæ and the nervures of the wings, their tips especially, indicated in faint clouds, streaks, and dots; the back of the thorax is dusted with somewhat similar cloudy streaks on the pale brown ground; abdominal segments red-brown or purple-brown, dotted and streaked with black, and finely sculptured in minute closely arranged cross-lines; cremaster decidedly projecting and rather flattened, armed with two small conical spines and some strong minute curved bristles. In a long, loose cocoon, or silken elongated bag, or cradle, on which are placed morsels of leaf or rubbish, and in which the pupa is easily visible, hanging by its anal hooks to the silk; placed among leaves or rubbish. No pupa is more worthy of notice for the extreme elegance of its minute markings, or for the graceful lightness of its pendulous cocoon.

The moth hides during the day in thick bushes, hedges especially, under ivy leaves, and in dense herbage generally. At dusk it flies with great vigour, but in a very erratic manner, along lanes and hedges, the margins of woods, shrubberies, and gardens where there is ivy on the walls, and from its colour is then a conspicuous object, and most exciting to the young collector. It may benefit the latter to know that when caught it must not be killed by means of ammonia, or the colour may be faded to yellow-brown.

Abundant throughout the South of England to the Scilly Isles. and to be found, in more moderate numbers, in all parts of England, though scarce in Cumberland and apparently not noticed in North Northumberland—Mr. Robson says that it is generally common in Durham and around Newcastle but is not found beyond the valley of the Tyne. In Scotland it has been found flying along the edge of a wood near Wigtown by Mr. R. S. Gordon, and there is an old record in Midlothian. Further west it seems to have occurred at Langholm near Glasgow, and in the Solway district. In Wales records are scarce, but it is doubtless of general occurrence, since I have found it at Pembroke. In Ireland it is widely distributed—from Waterford and Cork to Derry and Armagh—and in some districts, as Kerry, Monaghan, and Dublin County, abundant. Abroad it has a considerable range through Central Europe, Sweden, the Northern half of Italy, Corsica, Dalmatia, Livonia, Southern and Eastern Russia, Asia Minor, Armenia, and Tartary.

So far as Europe is concerned it stands, as a species, very much alone; but it has numerous Asiatic allies, some tending in the direction of *Abraxas*, some greatly resembling *Aridalia*.

Genus 2. **ANGERONA.**

Antennæ pectinated in the male; palpi short; thorax thick but rather narrow, covered with long scales; abdomen moderately slender; fore wings broad and ample, faintly crenulated behind; hind wings broad. their hind margins scalloped.

We have only one species.

1. **A. prunaria**, *L.*—Expanse $1\frac{1}{2}$ to $2\frac{1}{8}$ inches. Wings all ample, rather crenulated; in the male rich orange, dusted, rippled, or banded with purple-brown; in the female pale ochreous, similarly dusted or banded.

Antennæ of the male strongly pectinated with rather long, solid, ciliated black-brown teeth, which taper off to the tip, shaft yellow-brown; palpi short and small, fulvous; head rather smooth, pale fulvous; thorax narrow, covered with raised and somewhat spreading scales of a rich dark orange; abdomen rather slender, purple-brown with orange lateral and anal tufts. Fore wings broad; costa very faintly arched; apex angulated; hind margin gently rounded; dorsal margin also rather filled out; colour rich dark orange-red; discal spot elongated, orange-brown; general surface stippled all over with short and very slender, obscure, perpendicular orange-brown streaks; cilia pale yellowish-red chequered with dark red-brown at irregular distances. Hind wings rounded, but their hind margins scalloped or strongly crenulated; of the same rich orange colour and similarly covered with faint perpendicular orange-brown streaks; cilia yellowish-red, tipped with dark brown at the apex of each crenulation.

Or—The orange-red colour with the delicate darker streaks confined to the middle area of the fore wings; the basal portion, a very broad stripe along the hind margin, and frequently the dorsal margin, dull orange-brown with a purplish bloom, or purple-brown. The hind wings almost wholly of this

darker colour, with but a cloud of orange-red remaining in the middle.

In the female the antennæ are simple, the thorax but little thicker, but the abdomen very much so; fore wings crenulated behind, pale yellowish-ochreous, dusted with orange-brown in minute erect streaks; the discal spot a perpendicular orange-brown or purple-brown streak; hind wings deeply scalloped at the hind margin, similar in colour, with a dull brown central spot; cilia concolorous.

Or—With very broad markings, similar to those in the second form of the male; the base of the fore wings to near the middle and sometimes that of the hind wings purple-brown, very smooth in tint, darker or paler; and with a very broad band of the same along the hind margins.

Underside much less dusted, but in other respects, in the various forms, almost an exact reproduction of the upper.

The alternative forms above mentioned occur so much together, and so constantly, that both seem to be typical of the insect, though perhaps the banded females are hardly so widely distributed as in the other sex, and in the Northern Midlands such examples, in either sex, are very rare.

Variation naturally surrounds these forms, but is not frequent. In Mr. Sydney Webb's collection are pale orange males devoid of the darker streaks and spots, or with the cilia only spotted; one, on the other hand, has the dark orange perpendicular streaks so greatly developed as to crowd the whole of the wings; another is striped in longitudinal clouds with orange and yellow; another has the bands of the second form broad and very silky, but of an excessively pale purple-brown, in which the orange blotches show a singular glow of colour; in another specimen the hind wings are wholly purple-brown, without a trace of orange, while two others extend that variation to both fore and hind wings, one being wholly silky purple-brown, the other purple-drab. Most of these are reared from Kentish larvæ.

In Professor Meldola's collection is a specimen in which the usual darkened portions of the wings are entirely pale fuscous; Mr. S. J. Capper has a pale yellow male, with orange longitudinal stripes, and the Rev. Joseph Greene one of a deeper yellow. Aberrations in the female are not so extreme; some in the paler form are almost or quite devoid of the small perpendicular streaks, while those of the banded form vary in the colour of the bands from purple-brown to purple-drab. One of Mr. Webb's specimens has the central blotch of ground colour of the fore wings of a very warm soft orange; another is wholly of a pale primrose; and one in Mr. Capper's collection has the bands of an excessively pale fuscous, yet delicately visible. The Rev. T. W. Daltry tells me that in North Staffordshire, where he does not find the banded forms, the perpendicular streaks and speckles are very dark.

On the wing at the end of June and in July.

LARVA twig-like, rounded, slightly tapering towards the head; there is a small transverse hump on the fifth segment, and a large transverse prominence, with four points, on the ninth, the two outer points being the larger; two small dorsal points on the twelfth, and similar but smaller on the tenth and eleventh, while two little points protrude from the anal segment; head flattened, brown, not shining, having a whitish projection on each side of the mouth. Body ochreous-brown or pale ochreous, sparsely mottled with dark brown, especially on the humped segments; dorsal line much interrupted, dark grey, most apparent on the third and fourth segments; undersurface paler than the ground colour, but dotted with black, and with two indistinct blackish lines on the segments, most conspicuous before the first pair of prolegs. (C. Fenn.)

August till May on blackthorn, hawthorn, willow, plum, guelder-rose, clematis, honeysuckle, broom, pear, and other fruit trees, privet, birch, hazel, and mountain ash; in con-

finement it will eat various shrubs, mint, and garden flowers. Hoffmann adds whortleberry, raspberry, and golden-rod. It hibernates while rather small, and may be kept alive easily by sleeving it out upon a shoot of ivy, which it will occasionally gnaw. It continues to feed for a rather long time, yet is easy to rear.

PUPA rather gracefully formed, elongated, a little flattened in front, wing-covers rather thickened but unsculptured, dull black; limb and antenna-cases of the same colour, the latter sculptured with indications of the pectinations; dorsal plate smoky-brown, smooth; dorsal segments chestnut, minutely pitted in a scattered manner; abdominal segments also chestnut, pitted more extensively, except at the posterior margins, with minute punctures; cremaster rather flattened and drawn out to a point, terminated by a very strong curved spine and attendant curled bristles. In a thin white silken cocoon, among leaves. The hooks of the cremaster are entangled firmly in the silk, and the pupa wriggles and turns with extreme activity therein when disturbed.

The moth frequents woods, especially those which abound in undergrowth, among which it hides during the day; yet may often be beaten out, when it hurries away to some similar retreat. Soon after sunset the male flies of its own accord, vigorously, over the bushes, and especially along open wood-rides, and continues on the wing till dusk, or on favourable nights till 10 or 11 P.M., but apparently not later at night, nor in the morning; the female being less active, and flying a little later. At one time it was frequent in the woods which now have disappeared, giving place to the outer suburbs of London. Still, it is quite common in the woods of Kent—whence the most richly coloured forms are usually obtained—and in Sussex, Surrey, Hants, Dorset, Wilts, Berks, Middlesex, and Essex. Also found in the woods which edge Dartmoor, and elsewhere in Devon, in East Cornwall, Somerset, Gloucestershire, Herefordshire, and Worcester-

shire; Cambridgeshire. Suffolk. Norfolk, and Lincolnshire; apparently Yorkshire, where it is very local, is its northern limit in these islands. In Wales, where I have taken it in a large wood in the middle of Pembrokeshire, it is likely to occur in all suitable places. Extremely local in Ireland, occurring in Kerry, Cork, Waterford, Limerick, and Galway.

Abroad it has an extensive range through Central Europe, the temperate portions of Northern Europe, the Northern half of Italy, Southern and Eastern Russia, Bithynia, Tartary, the districts of the Altai range, the Corea, and Japan; in the last-named country varying very greatly in size.

Genus 3. **RUMIA.**

Antennæ threadlike; palpi rather short; head rough; thorax and abdomen smooth and slender; fore wings squared at the tip, hind margin quite even; hind wings broad, rounded, also with even margins.

We have but one species.

1. **R. cratægata**, *L.*; **luteolata**, *Staud. Cat.* — Expanse $1\frac{1}{4}$ to $1\frac{5}{8}$ inch. Wings bright sulphur-yellow, clouded and spotted on the costa with dull purple; reniform stigma edged with the same colour.

Antennæ of the male simple, nearly naked, dull purple at the base and in front, yellowish-white elsewhere; palpi slender and short, pale chocolate; eyes dark brown; head rough and tufted, bright yellow, tinged with chocolate around the eyes; thorax also bright yellow, loosely covered with long scales; abdomen slender, smooth, pale yellow, lateral tufts spreading, anal tuft small. Fore wings broad; costa very faintly arched; apex squarely angulated; hind margin gently rounded, and but little oblique; dorsal margin straight; colour bright sulphur-yellow; first and second lines obscurely perceptible as rows of greyish crescents or streaks; reniform discal spot white, with a chocolate margin; this is connected with the third of a series of dull purple-brown, or purple-

red, blotches or clouds which lie upon the costa, and are very irregular in form and size; towards the apex of the wing is a more definite prostrate triangle of the same colour; cilia yellow, dotted with chocolate. Hind wings rounded behind; sulphur-yellow; central spot obscurely pale grey, followed by a most indistinct, and often fragmentary, irregular, central transverse line; cilia yellow, spotted and clouded with chocolate. Female very similar, a little stouter, often larger, and with the transverse markings more visible.

Underside light yellow, with the central spot of all the wings, and a slender curved transverse line towards the hind margin, dark chocolate; a pale chocolate stripe lies along the costa of the fore wings, thickened and then tapered off towards the apex; cilia spotted with chocolate; legs of the same colour, untufted; body pale yellow.

Usually very constant in colour and markings—such as they are—but occasional specimens have the transverse lines very prettily and distinctly rippled in crescents between the nervures, and much more rarely these ripples give rise to longitudinal dashes of the same semi-transparent greyish shade. Two such—male and female—are in the collection of Mr. Sydney Webb. Another of his specimens is quite white, having no trace of the usual yellow colour, and a very lovely example of this form is in the cabinet of the Rev. Joseph Greene. Mr. S. J. Capper has another such, and also a yellow specimen in which the chocolate costal blotches have run together into a complete costal stripe. Variation in this direction, though in a less complete degree, is not very rare, as also in the absence of these spots, specimens wholly yellow being found in Somerset and other western counties. A specimen having the fore wings white is in Mr. P. M. Bright's collection, and I remember the exhibition by Dr. R. Freer at the Birmingham Entomological Society of a beautiful example, taken in Staffordshire, of a rich orange yellow, with a deeper shade of the same along the costa. A supposed aberration, occasionally to be seen in collections, has long

brown stripes on all the wings between the nervures; this form is (naturally) always obtained at light, usually in a room, and may at once be produced by passing an ordinary fresh specimen quickly through a gas flame.

On the wing in April, May, and June, and as a second generation in July and August.

LARVA stout, very twig-like; third segment swollen laterally; seventh with a large bifid dorsal protuberance; slight transverse prominences on the eighth, ninth, and tenth, that on the ninth the largest, but one of them, or even all three, sometimes wanting; eighth and ninth segments of the undersurface each with two small tubercles or rudimentary legs. Head squared above, slightly bifid, the face vertically flattened; ventral spots raised; third pair of legs extended in repose. Dull purple, shaded with pale grey and red, but without markings; face similar, top of the head paler.

Or—Dull brown, or blackish, dusted with green towards each extremity, and having a pale greenish crescent-shaped lateral marking on the third segment.

Or—Dull dark grey with indistinct blackish diamond-shaped dorsal pattern; sides shaded with pale grey.

Or—Ferruginous with indistinct pale bluish-grey dorsal diamonds; sides of the middle segments clouded with purplish-grey, and the dorsal line very faint grey.

Or—Of the exact colour of a purple hawthorn-twig, with the tips of the dorsal projections redder.

All these forms graduate into each other. (C. Fenn.)

September to April (hibernating), and as another generation in July and August, sometimes September. On hawthorn, and occasionally upon blackthorn and apple; more rarely on other fruit trees, wild-service (*Sorbus torminalis*), whitebeam, and hazel; feeding at night.

By prolonged and careful experiments Professor Poulton and Miss Lilian Gould have succeeded in proving that the

varying colours of the larva of this species, from dark brown to green, are directly affected, and to all appearance *caused*, by their surroundings; the green colour being gradually assumed by almost every larva which was fed continuously on very green and light-coloured food; while those fed on old dark green leaves, with dark twigs, remained in a large proportion dark brown. While watching the larvæ in the course of these experiments Miss Gould made the curious and interesting discovery that, when hanging by a thread from the food plant, the larva would whirl itself round when disturbed, and spin upon the thread with such swiftness as to become quite indistinguishable from any bit of dead leaf twirling in the wind on a thread of spider's web.

PUPA elongated and moderately slender; eye-covers smooth and prominent; limb and antenna-covers very strongly marked, but not sculptured; wing-covers showing all the nervures raised in strong relief, with the surface between so sunken that the whole front thoracic region is corded longitudinally with ribs and limbs, and without sculpture; colour black-brown; the dorsal region also smooth, dull pale olive-brown, or yellow-brown; abdominal segments similar but of a redder colour towards the anal extremity; cremaster darker, short and blunt, roughened and furnished with a bunch of curled bristles. In a thin paper-like silken cocoon of a pink or reddish colour, among leaves or rubbish on the ground.

It has been definitely ascertained that this species passes the winter in the larva, and also in the pupa state. The Rev. C. R. Bree says "it differs from all other British species as far as I am aware in its broods; it emerges from the pupa state at three different periods of the *same year*—viz., April, June, and August; but the June brood is not the produce of the April moths, but of those of the preceding August, which pass the winter in the *larva* state, and feed again in the spring, while those from the June brood become pupæ in the autumn, and produce moths in April. The specimens which

appear in June are always larger and finer in colour and markings than those of the other two broods."

The moth appears to exist in almost every hawthorn hedge in these Islands. It may anywhere be beaten out in the daytime, or seen at rest under a leaf on a hedge-bank. It flies briskly and plentifully at dusk, and is so strongly attracted by light as to fly at once stupidly into a flame. There is no appearance of double broodedness in its more northern range, and doubtless the overlapping broods, noticed in the south, are there absent. So far as is known it has not been taken further north than Moray and the Hebrides, but in England, Wales and Ireland its abundance is universal. Also found in all parts of the Continent of Europe, except the coldest; and in Asia Minor, Armenia, Eastern Siberia, and Northern Africa.

Genus 4. **VENILIA.**

Antennæ simple, palpi minute, head and thorax rough, abdomen smooth and slender, fore wings with the apex squared and the hind margin beneath it faintly hollowed, hind wings slightly squared.

We have only one species.

1. **V. maculata**, *L.*—Expanse 1 to 1½ inch. Slender, orange-yellow, all the wings spotted, in transverse rows, with dull yellowish-black, usually blacker on the hind wings.

Antennæ of the male rather short and thick, notched, almost naked, purple-brown; palpi very small, and, with the head, covered with rather rough scales of mixed yellow and black; thorax narrow, similar, the scales not very long; abdomen slender, smooth, black-brown, dusted with yellow; lateral tufts minute; anal tuft small, yellow.

Fore wings retuse, moderately broad; costa gently arched; apex angulated; hind margin just below it faintly hollowed, but in the middle elbowed, and rounded off below; dorsal

margin rather straight; colour soft ochreous or chrome-yellow, with numerous large yellow-black spots disposed in stripes—a rather straight and unbroken stripe near the base, a central band, composed of a large erect dorsal blotch and two broken or constricted spots, and a series of three before the hind margin—two elongated blotches on the hind margin, including most of the cilia, form a sort of fourth stripe; the remainder of the cilia are yellow. Hind wings rather deeper yellow or ochreous, having usually five or six similar large angulated spots which are not quite placed in stripes, yet in some degree suggest them; along the hind margin is a row of similar spots which include the adjacent cilia, the latter between them being ochreous; in all the wings there is towards the base a dusting or dotting of black. Female very similar.

Underside of the fore wings of a rather richer ochreous-yellow, the spots reproduced but blacker; hind wings paler yellow, and the spots of the upper side indicated, but paler. Body and legs yellow, dusted with black.

Very variable in the depth of the ground colour, from pale yellow to rich orange-ochreous, but the paler colouring sometimes results from fading during life, and this probably accounts for the disparity often seen between the colours of the fore and hind wings. But it is in the size of the yellow-black spots and the degree of intermediate dusting that the most striking variations are found. In a form formerly described as a distinct species, under the name of *quadrimaculata*, these are reduced to four spots on the costa of each fore wing, the remainder and the hind wings being immaculate. This was—and is—a very rare form. Mr. Sydney Webb has one such in Mr. Bond's collection, and there is a specimen in that of the late Mr. H. Doubleday, at Bethnal Green Museum. In Mr. Webb's cabinet is a specimen devoid of spots—merely plain yellow—also some having three costal spots; others in which the usual spots are present in faint indications, or are distinct but very small; others have the

spots crowded in the basal half of the wings, the outer halves being almost spotless; one from Mr. Bond's collection has a broad band of coalesced black spots, another a band of elongated spots or bars; and one specimen is almost wholly dark orange-brown, the costa a little more yellow. Mr. J. A. Clarke also has one almost wholly dark brown, and another with a broad black-brown band near the base of the fore wings; and in Professor Meldola's collection is one richly coloured, but with the usual black spots only indicated in deeper yellow. In a specimen which I took in Surrey many years ago more than one-half the spots are absent from the fore wings and the rest altered in shape, while the hind wings have only a few dark dots. Most of these seem to be mere aberrations, but Mr. W. H. B. Fletcher has pointed out that there seem to be racial variations in the North of Scotland, where, in Sutherlandshire, the black blotches are frequently very much enlarged, or else greatly crowded towards the base of the wings.

On the wing at the end of May and in June.

LARVA smooth and without projections; head rounded, shining green, body longitudinally and alternately striped with green and white; the dorsal stripe dark green or purplish-brown; parallel with it on each side are three slender white subdorsal lines, divided by stripes of green, which are in each case darkest at the edge, and the lowest of which includes the spiracles; these are white, in black ovals; below them is a broad greenish-white longitudinal stripe; legs green.

July and August on wood sage (*Teucrium scorodonia*), *Lamium purpureum*, *Stachys sylvestris*, and almost certainly *Galeobdolon luteum*.

PUPA very thick in the middle, the tips of the wing-covers considerably raised from the adjoining segments, tapering a little forward, and very considerably behind; head rather full and prominent, the palpus-covers forming a round button;

leg-covers abundantly and minutely sculptured in fine, cross, incised lines; antenna-covers strongly barred at the joints; wing-covers rather roughly sculptured all over in transverse lines. dorsal and abdominal segments with distinct pits, except each hinder edge, where is a smooth band; colour purple-brown, more chestnut on the back; cremaster a strong knob arising from a thickened anal segment; it is armed with a strong curved spike, around which are several hooked bristles.

In this condition through the winter.

This moth flies only in the daytime, and principally in bright sunshine, and in hot weather the male is extremely active, hurrying along wood paths, over undergrowth, through all the open parts of woods, and along their margins, in a most restless manner. The female flies at the same time but more gently. I have never seen either sex on the wing in the evening, nor at night. In warm cloudy weather it will move about by day, flying quietly, or will sit on a leaf with wings half-erect, alert and ready to flit away on the least disturbance, yet it is then quite easy to catch. Almost confined to woods and their neighbourhood, including any meadows, roads, and lanes close by, and is there a very conspicuous and pretty object. Very common in such situations throughout the greater part of the South of England, though said to be scarce in Dorset and Wilts; much less common in the Eastern Counties north of Essex, and in the Midlands—indeed, there seems to be but one record of its occurrence in Cambridgeshire. Not scarce in the Western Counties, but apparently absent from fen and marsh districts. In Yorkshire it is local and not common, in Lancashire confined to the district around Grange and Silverdale, and now scarce; found also in Westmoreland, and at Keswick in Cumberland. Abundant at Dolgelly and Bala, North Wales, but I have no record for South Wales. In Scotland it has a wide range, in wooded areas, in the Solway and Clyde districts, in Perthshire,

Inverness-shire, Moray, Argyleshire. and Sutherland. In Ireland it is very local though not scarce, confined to the South and West—Wicklow, Waterford, Cork, Kerry, Galway, and Sligo.

Abroad it is found all over the Continent of Europe except the extreme North and South. also in Bithynia and Asia Minor.

Genus 5. **CABERA.**

Antennæ of the male strongly pectinated, the tip thread-like; of the female simple; palpi short; head, thorax, and abdomen smooth, the latter tapering; fore and hind wings evenly rounded.

LARVÆ cylindrical, a little thickened behind; feeding on trees.

We have two species, both white and much alike, yet readily discriminated.

A. Wings white, sparingly dusted with brown-black atoms, outer lines of fore wings straight. *C. pusaria.*

A². Wings white, much dusted with ochreous-brown, outer lines curved. *C. cranthemaria.*

1. **C. pusaria**, L.—Expanse 1 to 1 $\frac{1}{4}$ inch. Wings all rounded, glistening silky white; on the fore wings three and on the hind wings two tolerably straight, transverse, faint brownish-grey lines.

Antennæ of the male rather short, pectinated with long oblique, solid, ciliated teeth to near the tips, white; palpi very small and obscure, apparently not protecting the tongue in any way, it being well developed; head smoky-white, the scales smoothed forward and downward; thorax and abdomen slender, quite white, the shoulder-lappets covered with long raised loose scales, and the lateral and anal abdominal tufts well developed. Fore wings short and blunt, costa arched, apex bluntly angulated, hind and dorsal margins gently

rounded; silky and glistening, snowy-white, faintly dusted, along the costa and hind margin, with minute black-brown scales; the first line rather curved, the second oblique and very straight, the central line between them almost equally so, all three of a faint undertone of grey-brown or smoky-grey; no other markings; cilia white. Hind wings broad and rounded, of the same silky-white, faintly dusted with blackish scales; and crossed by two similar transverse lines, both very slightly curved. Female with simple antennæ and stouter body, not otherwise differing.

Underside of all the wings silky-white, the costal region of the fore wings dusted with black-brown. Body and legs greyish-white.

There is variation in the number of transverse lines on the fore and hind wings, an additional one appearing as the ordinary basal line, sometimes therefore there are four equidistant lines on the fore wings and three on the hind. In other examples one or more of the ordinary lines disappears, until in rare instances the insect is of a pure white devoid of markings. Such a specimen, of a glittering brilliancy of whiteness, was reared by Mr. R. Newstead, from Delamere Forest, Cheshire, in 1887. Another condition in which it is without the lines is where the dusting of dark atoms has so enormously increased that the wings are wholly, or almost wholly, leaden black. This is rare, but specimens exist in various collections, and occasionally the costa of the fore wings alone is white. Intermediate specimens are very rare, but in the North of Ireland a tendency in this direction is shown, a peculiar grey shading suffusing the wings, while the lines are tinged with brown.

Besides these forms there is a peculiar, almost structural variety, which was long looked upon as a distinct species under the name of *C. rotundaria*. In this the fore wings are more rounded, sometimes very much so, and their first and central lines drawn near together, or actually fused, giving it a notably different appearance. But strong suspicions as to its

distinctness were aroused by the circumstance that it was reared always among typical *C. pusaria*, from larvæ not separable from those of that species. Finally Mr. E. A. Atmore, having collected a very large number of larvæ from alder and birch in the neighbourhood of King's Lynn, reared from them, among abundance of typical *C. pusaria*, some with reduced numbers of transverse lines, several of the form *rotundaria*, others intermediate between them, and one example not symmetrical, the wings of one side being of the typical *pusaria*, on the other of a variety approaching to *rotundaria*.

On the wing in May and June, and as a second brood in August.

LARVA slender, cylindrical, slightly enlarged behind; head rounded, rather sloped, and flattened in front, reddish-chocolate; face green; body reddish-chocolate with a purple tinge on the sides; a series of pairs of whitish dorsal spots, two on each segment; an interrupted pale ventral stripe, but the undersurface from the second to the fourth segments pale green, between the prolegs pale bluish-green; the whitish dorsal spots are lengthened into white dashes on the middle segments. (C. Fenn.)

July, and again in September, on birch, alder, oak, willow, hazel, and other trees, feeding at night upon the leaves.

PUPA stout, rather ovate, having a full curve from the head over the dorsal region to the tail; head and eye-covers rather prominent; antenna-cases ridged and delicately sculptured with cross lines; wing and limb-covers unusually smooth, olive-green; anterior portion of the dorsal region greenish or olive-brown; dorsal segments glossy chestnut-brown; abdominal segments similar, but deepening in colour to the anal, and with the divisions rather darker; tip of the anal segment somewhat swollen, dark brown; cremaster a mere tubercle of the same colour, armed with a pair of closely appressed terminal spikes or bristles. In a cocoon of silk and earth

under moss, or under a dead leaf on the ground ; spun closely to this covering. In this state through the winter.

The moth hides during the day in bushes, sitting on the underside of a leaf, and may be beaten out with the greatest ease, when it flies sluggishly to a similar shelter close at hand. At early dusk it flies voluntarily but is always gentle and slow in its movements, and may easily be caught in the hand. After dusk it sits about on the undergrowth and may constantly be seen by the aid of a lantern. I have even found it sitting on the upper leaves of tall reeds, in company with common *Noctua*. Most plentiful in open woods, but found also along hedges about lanes and fields. Apparently rather local in Cornwall, but otherwise abundant throughout England, Wales, and Ireland, and in Scotland to Moray and the Hebrides, if not beyond.

Its variety *rotundaria* seems to be scarcely so widely distributed, and is perhaps most frequent in the Eastern Counties, but has been twice reared, in Ireland, from larvæ found near Dublin and in Mayo; and once captured on the wing in Scotland. It is also recorded from Germany. The typical insect is widely distributed through Central and Northern Europe, Northern Italy, Corsica, the Balkan States, Southern Russia and Eastern Siberia.

2. **C. exanthemaria**, Scop.—Expanse 1 to $1\frac{1}{4}$ inch. Wings broad and rounded, white, much dusted with pale yellow-brown; fore wings with three, and hind wings with two, faint curved yellow-brown transverse lines.

Antennæ of the male pectinated with solid, oblique, ciliated teeth to near the apex, the final portion being notched, brownish-white; palpi minute, white; tongue well developed; head smooth, white; thorax and abdomen dull white, smooth except for the long scales on the shoulder-lappets; lateral and anal tufts of the abdomen small. Fore wings broad and blunt; costa arched; apex extremely bluntly angulated, almost rounded; hind margin perpendicular to the middle,

there elbowed, and thence rounded off; dorsal margin nearly straight; colour white, much dusted with yellow-brown, and on the costal and hind-marginal areas with darker brown; first, central, and second lines narrow, equidistant, curved and a little indented, obscure brownish-yellow, cilia yellowish-white. Hind wings broad, rounded, similar in colour and in dusting, and having two similar, obscure, curved transverse stripes; cilia yellowish-white. Female rather stouter, with simple antennæ, and colour sometimes whiter, but very similar.

Underside of all the wings white, abundantly dusted with dull brown, especially so on the costal half of the fore wings. Body and legs dusky-white.

Variation in respect of the number of the transverse lines occurs in this species in much the same degree as in the last; in the collection of the late Mr. Frederick Bond is a specimen devoid of lines, and Mr. G. B. Routledge has taken a similar example in Cumberland. Dr. Mason possesses a specimen in which two lines coalesce just as is the case in the var. *rotundaria* of *C. pusaria*, and others in which they tend in the same direction. An individual taken at Scarborough, and in Mr. Webb's cabinet, has the central and second lines much broadened and toothed; another, obtained from Tilgate Forest, has the portion of the fore wings outside the second line blackened. Farther than this melanism does not seem to obtain in this species.

On the wing from the end of May or June till the beginning of August, but apparently in but a single generation.

LARVA elongated, slightly attenuated in front, face sloping forwards, flattened; a dark purple, reddish, or brownish dash on the outside of each lobe of the green head, and a grey shade down the face; body yellowish-green, yellowish-brown, or brownish-green; dorsal line pale grey, containing a black spot at each incision and edged laterally with whitish; each segment shaded transversely with purple; spots and spiracles

dusky-black, each of the latter placed in a purple blotch ; legs and prolegs reddish or purplish.

Or—Pale yellowish-green, the dorsal portion shaded with lemon-yellow between the subdorsal lines ; dorsal line reddish, spotted as above ; subdorsal and spiracular lines yellow, threadlike and indistinct ; incisions of the segments yellow ; head dull green, lobe dashes dark brown ; legs pink ; a black or reddish-black dot on the first pair of prolegs.

Or—The black dorsal spots are placed in an ochreous stripe, which often is enlarged into a series of dorsal diamonds, separated by the white-margined black spots.

Or—Grass-green with a broad reddish cloud on the back, through which the dorsal line passes ; subdorsal lines broad, yellow ; other body markings absent.

All these variations shade into each other. (C. Fenn.)

July, August, and September on willow, alder, and birch. According to Hofmann it is found on other deciduous trees. It feeds at night, and usually conceals itself by day near the ground.

PUPA short and thick ; head and eye-covers but slightly prominent ; limb-covers closely compressed, and those of the antennæ only just cross-sculptured at the joints ; wing-cases thickened and smooth, glossy brownish-green, as is all the front thoracic portion ; dorsal region pale brown ; abdomen short and small, tapering very suddenly, chestnut-brown, with the edges of the segments rather darker ; anal tip black. the cremaster shortly triangular, and tipped with a little tuft of hooked bristles.

In a thin cocoon of silk and earth, at the surface of the ground, and ordinarily attached to a root, fallen leaf, or stone.

In this condition through the winter.

The moth sits by day in willow and other bushes, and may be beaten out, but very often will just flutter down to the ground, and is always sluggish. Its habits are quite like

those of the last species, except that it is perhaps more attached to *damp* woods, marshes, and fens, though occurring in woods generally. and along hedges in lanes and fields. At dusk it flies, though lazily, and afterwards may be found sitting on herbage and sallow bushes, or attracted to any strong light. Common in most parts of the Southern half of England, except Cornwall, where it seems to be scarce, and throughout the Eastern, Midland, and Western Counties; but becoming scarce in South Yorkshire, and local in the rest of that County. I find no record north of this on the east side of England, but on the west it reaches Cumberland. Doubtless common throughout Wales, though scarcely recorded further than my own observation in Pembrokeshire. In Scotland it is well distributed, again reaching the Eastern districts at Edinburgh and in Aberdeenshire and Kincardineshire; in the west extending to West Ross. In Ireland everywhere abundant.

Abroad its range is very wide, over Central and Northern Europe, the North of Spain and Italy, Corsica, the Ural Mountain district. Bithynia, Armenia, Tartary, and Japan.

Genus 6. **BAPTA.**

Antennæ short, simple, rather thick; palpi small; head, thorax, and abdomen smooth. the latter short and cylindrical; fore wings not broad. apex angulated, of delicate texture; hind wings evenly rounded, but squared at the anal angle.

LARVÆ smooth, stout, cylindrical.

We have but two species, both white, but readily distinguished.

A. Fore wings with a large silver-grey cloud beyond the middle. *B. temerata.*

A². Fore wings with two triangular black costal spots. *B. taminata.*

1. **B. temerata**, *Schiff.*; **punctata**, *F.*—Expanse 1 to

1 $\frac{1}{4}$ inch. Fore wings somewhat ovate, very silky; white, with a black central dot, and a blackish streak below it; a large silver-grey cloud towards the hind margin is divided by a rippling white stripe. Hind wings white.

Antennæ of the male threadlike, almost naked, pale brown, but at the back white towards the base; palpi minute, pale brown; tongue exposed; eyes black; head pure silky-white, the face remarkably smooth and glossy; thorax and abdomen glossy white, the former with long loose scales on the shoulder-lappets, the latter with very small lateral and anal tufts. Fore wings slightly ovate; costa arched; apex decidedly angulated; hind margin gently rounded, but the anal angle distinct; dorsal margin straight; colour silky snowy white; discal spot a round black dot; below it near the dorsal margin is a short rippled black cloudy streak; no first line; second line black, repeatedly angulated and indented, shaded inwardly with black dusting, but hardly reaching the costa; outside it, above the middle, separated by a rippled white stripe, is a large dense cloud of black atoms, and along the hind margin a row of distinct black lunules; cilia white, shaded with smoky-grey. Hind wings broad, rounded behind, but squared at the anal angle; silky-white; the central spot a minute black dot; just beyond the middle is a shaded faintly black transverse stripe, followed by another, more obscure, lying near the hind margin, and formed of a mere dusting of black scales; hind margin faintly streaked with black; cilia glossy white. Female accurately similar.

Underside of all the wings snowy-white; the fore wings having a faint smoky tinge along the costa, and the black discal spot visible through from above. Body silky-white; legs pale brown.

Variable in the intensity of the black clouding in both sexes, some specimens being darker, others much whiter than typical forms. One in Mr. Sydney Webb's collection has a central stripe visible and tolerably straight, another has a very strong leaden tinge with blackened apex and hind

margins; and in the cabinet of the late Mr. F. Bond is a specimen having a black spot at the base of the fore wings.

On the wing in May and June.

LARVA cylindrical, but the head a little narrower and rather flattened; pale green, with an orange-red spot, bordered with black, upon each lobe; body smooth and soft in texture, bright green, with a row of red or orange-red spots down the back, each of which is bordered with rich brown; these are separated on the middle segments, but joined together on the anterior and hinder; the back is faintly dotted with greenish-white, and the sides with black, the spiracles being brown; under-surface and legs pale green. Before full growth the red spots are absent, the space being occupied by a broad yellow dorsal line; but the infant larva is wholly deep yellow. The Rev. J. Hellins says "the only variety of the larva that I ever saw was of a pale bluish-green ground colour, the sides and ventral surface being more of a whitish-green; the bright red dorsal spots of the type were replaced by a very indistinct, interrupted, reddish-brown line, and on either side of this there was, on each segment, a whitish dot, while the usual red spots on each side of the head were absent." This larva was figured by Mr. Buckler, and reared.

End of June and July, sometimes August, on blackthorn, bird-cherry, and plum; but abroad, also on rose, willow, birch, and oak. Mr. Hellins states that the egg is laid in crevices of the bark, or at the axils of the shoots, of the food plant, and that if not furnished with these, the moths will lay few, if any, eggs.

PUPA apparently not described. In this stage through the winter.

The moth hides during the day among undergrowth in woods, or in hedges in wooded districts, and flies at early dusk along the lanes, rides and open portions, with a very soft gentle movement. It seems more particularly attached

to the neighbourhood of *beech* woods. Formerly it was to be found in the woods close to the London suburbs, but seems now to have retired further into the country. Still to be found, though often sparingly, in Kent, Sussex, Surrey, Hants, Berks, Middlesex, Bucks, and Wilts, very locally in Dorset. in Devon plentifully on the south coast—even upon sea-cliffs—also in Cornwall, but rarely in the Western portion. Locally rather common in the Eastern Counties, including Cambridgeshire and Huntingdonshire; and in Somerset, Gloucestershire, Herefordshire, Worcestershire; becoming more local or rare in Cheshire, Derbyshire, Lancashire, and Yorkshire, and rare in Cumberland. Apparently throughout Wales, and not rare in Pembrokeshire. In Scotland I know of but a single capture, a specimen—which I have seen—taken at Corsemalzie, Wigtownshire, by the Messrs. Gordon. In Ireland it is said to be plentiful at Killarney, common in several localities in Galway, and found occasionally in Wicklow and Sligo.

Abroad it is found throughout Central Europe, the Northern half of Italy, Livonia, the Ural Mountain district, Tartary, and Japan—those from the last-named being sometimes suffused with grey.

2. **B. taminata**, *Hub.*; **bimaculata**, *Haw.*—Expanse 1 to 1½ inch. Fore wings silky-white, with two black-brown spots on the costa, from which frequently arise slender dotted transverse lines. Hind wings silky-white with a similar line.

Antennæ of the male simple. almost naked, pale brown, the back portion towards the base white; palpi small, brown; face also brown, very smooth, cut off by a sharp division between the antennæ from the upper part of the head, which is pure white and rather rough; thorax and abdomen smooth, snowy white. but the scales on the shoulder-lappets rather raised; lateral and anal tufts very small. Costa of the fore wings much arched; apex decidedly angulated; hind margin gently curved, but the anal angle well formed; dorsal margin

straight; silky-white with a very faint tinge of brown dusting along the dorsal and hind marginal regions; on the costal margin are two conspicuous triangular black or reddish-black spots, from each of which arises a slender transverse line of faint cloudy-brown dots; near the first of these is a small black discal dot; cilia white, with a faint brown line along the base. Hind wings broad, rounded, but with the anal angle squared, white; central spot minute, black; midway between it and the hind margin is a slender, curved and dotted, pale brown line; cilia white. Female accurately similar.

Underside white, the fore wings shaded towards the costa with smoky-brown; each wing has an elongated, central, black cloudy dot, and beyond it a faint transverse brownish line. Body white; legs whitish-brown.

Not very variable; but the size of the two costal spots is somewhat uncertain and also their position—nearer or farther apart—and the dotted transverse lines arising from them are similarly shifted. These lines also are often nearly obsolete; but more rarely are rather distinct, with also traces of central and subterminal lines; this last form being apparently most frequent in the New Forest. Occasional specimens have a smoky tinge over the cilia. An example in Mr. Sydney Webb's collection has suffused streaks running in brown lines the whole length of the fore wings; another is devoid of the inner black costal spot; and one of the late Mr. F. Bond's specimens is pure white, absolutely spotless.

On the wing in May and June.

LARVA rather stout, smooth, cylindrical; head yellowish-green, dusted with purple; body dark velvety green; dorsal surface with a row of irregularly diamond-shaped purple spots; spiracular line very minute, threadlike, yellow; incisions of the segments yellow; spiracles black; undersurface whitish-green. (C. Fenn.)

June and July, on wild cherry, and occasionally plum and

hawthorn. During the day it rests extended along the mid-rib of a leaf, and feeds at night.

PUPA stout, polished, reddish-brown, the wing-cases tinged with green; anal extremity furnished with a short projecting bristle. Subterranean, in an egg-shaped silken cocoon covered externally with grains of sand, and attached to a stone, root, or other object about one inch below the surface of the ground. (C. Fenn.)

The moth rests by day in undergrowth of woods, or in very thick hedges, from which it may be disturbed by the beating-stick, yet often merely flutters down to the ground. It flies at early dusk, and is confined to woods and well-wooded country, in the latter—in West Norfolk unquestionably—frequenting large well-grown hawthorn hedges. It has been found sitting upon the trunks of fir-trees—doubtless for shelter from strong wind. Attention has been called, by Mr. Lovell Keays, to an unpleasant odour emanating from this insect.

A local and very uncertain species with us; in its most favoured localities, as in the New Forest and the woods of West Norfolk, quite plentiful in certain seasons, very scarce in others. Also found, though not plentifully, in Kent, Surrey, Sussex, other parts of Hants, Berks, Wilts, Somerset, Gloucestershire, Bucks, Middlesex, Herts, Oxfordshire, and the Eastern Counties; in Devon rare, and but once recorded in Cornwall. Apparently absent from the Midland and some of the Western Counties, but found rarely in North Lancashire, Westmoreland, and Cumberland, and very doubtfully in Yorkshire. In Wales I found it rarely in Pembrokeshire, but know of no other record; and it seems to be absent from Scotland and Ireland.

Abroad it has a wide range over Central Europe, the Northern half of Italy, Southern and Eastern Russia, Bithynia, the mountainous regions of Central Asia, Japan, and the Corea.

Genus 7. **ALEUCIS.**

Antennæ simple, rather short; palpi short; head and thorax smooth; abdomen short, faintly crested on two segments; fore wings broadly trigonate, silky; hind wings broad, rounded behind, all the margins even.

We have but one species.

1. **A. pictaria**, *Curt.*—Expanse 1 to 1½ inch. Fore wings broadly trigonate, slate-grey dusted with black; first and second lines black, the latter very irregular; between them is a black discal spot. Hind wings greyish-white with a slender central line and grey cilia.

Antennæ of the male rather short, simple, finely ciliated, grey-brown; palpi minute, dark grey; tongue well developed, unprotected; head and thorax rather roughened with large scales, slate-grey dusted with darker; scales on the shoulder-lappets rough but not very long; abdomen glossy blackish-grey, with two very small grey dorsal tufts near the base; lateral tufts minute; anal tuft small, silvery-grey. Fore wings broadly trigonate; costa hardly arched except at the base and apex, which last is a little produced and angulated; hind margin oblique, almost straight, the anal angle well developed; dorsal margin nearly straight; colour slate-grey, or dark brownish-grey, dusted with black; first line curved, ill-defined, cloudy-black; second line a little more definite, of the same colour, angulated above the dorsal margin, and scalloped throughout, edged outwardly by a paler shade; discal spot ovate, dull black; along the extreme hind margin is a row of deep black dots; cilia shining grey. Hind wings rather elongated, rounded behind, and the anal angle hardly squared; glossy, smoky-white, tinged towards the hind margin with grey; along the extreme hind margin is a row of black dots; cilia grey. Female quite similar.

Underside of the fore wings shining, very pale grey, dusted on the costa and dotted along the hind margin with black;

discal spot and second line faintly visible, the latter blackened toward the costa; hind wings shining, smoky-white, dusted with brown; central spot black; beyond it is an obscure rippled smoky-black transverse line; cilia pale grey. Body and legs dark grey.

Very constant in colour, but in the collection of Mr. Sydney Webb are specimens having the cilia of the fore wings dusky-grey and black, and one in which a large black blotch lies on the dorsal margin of the fore wings, and a subterminal band of blackish scales on the hind.

On the wing in the middle to end of April.

LARVA almost cylindrical, the third and fourth segments very little swollen; anal segment squared behind; toward the hinder part of the body are several small tubercles; head blackish-brown, rounded, with the face flattened, a rounded spot on each lobe; body smoky-brown with an imperfect row of faintly black V-shaped dorsal markings; on each side of segments eight and nine is a dusky white blotch, sometimes almost uniting on the back, across the twelfth segment is a black line, and in front of the second and third pairs of legs is a black oblique streak; undersurface mottled with paler smoky-brown. Exactly the colour of the blackthorn twigs on which it rests. Mr. Buckler figures a curious variety which bears, indeed, no resemblance to the usual form, but is very pale blue-green with slender white longitudinal lines and an imperfect, dotted, darker dorsal line.

June, and the beginning of July, on blackthorn.

PUPA short and thick, the wing-covers very broad and rather dull from excessively fine sculpture of incised lines; head and eye-covers prominent and rather shining; antenna and limb-covers compressed and dull, sculptured with fine cross-lines; dorsal region glossy, roughly punctured; abdominal segments swollen, rather smooth, rapidly decreasing in size, anal segment swollen but very short, cremaster a sort of flattened button on which are two long hooked spines;

colour red-brown; cremaster dark brown. In a cocoon of silk mixed with earth, or in moss on the ground. In this condition through the winter.

The moth hides in the daytime in thick blackthorn bushes, or close to the ground about their stems, and is very rarely seen at that time, yet has been beaten out, and induced to fly, in the sunshine. At dusk it flies a little about the blackthorn blossom and has been known to visit sallow bloom; but as soon as darkness comes on settles down and may then be found sitting upon the bushes, by the aid of a lantern. Probably it flies again toward midnight and then is strongly attracted by light. So far as I have observed, the blackthorns growing in hedges are not favoured, but the stunted plants on open heaths or hillsides are usually selected. It is an exceedingly local species, and until its habit of sitting on the blackthorns at night was discovered by Mr. S. Stevens about the year 1856, was looked upon as a great rarity here. Its metropolis with us seems to be in Essex, where it was first captured at Berechurch near Colchester, in plenty, and since near Loughton, Malden, Hazeleigh, Danbury, Southend, and Leigh. In Kent its great locality used to be Dartford Heath, but it is said to have been exterminated there by over-collecting. It has not, however, I think, disappeared from the county. Also found in Sussex, and pretty commonly in the New Forest, Hants. There are records in Surrey, Berks and Suffolk, and it was reported to occur in Devon by Mr. Parfitt. So far as I know this is the extent of its range in these Islands. Abroad also it is somewhat local and not very widely distributed, being found in Central, Southern, and Eastern Germany, France, Switzerland, and Spain.

Genus 8. **MACARIA.**

Antennæ of the male not pectinated but rather dentate; palpi small; head rough; thorax and abdomen smooth and

slender; fore wings rather elongated, arcuate or sub-arcuate; hind wings angulated.

LARVA rather short, cylindrical; living on trees and shrubs.

We have three species, two of which are very similar.

- A. Fore wings distinctly excavated below the tip; a much divided chocolate spot beyond the middle.
- B. Dusky white tinged with yellow-brown, the spot distinctly divided by white lines. *M. notata*.
- B². Dusky white tinged with grey-brown; the spot obscurely divided and crossed by a grey band. *M. alternata*.
- A². Fore wings very slightly excavated, slate grey; no divided spot. *M. liturata*.

1. **M. alternata**, *Schiff.*—Expanse $1\frac{1}{3}$ to $1\frac{1}{4}$ inch. Fore wings concave below the tip; greyish white with faintly darker cloudy lines arising from chestnut costal spots; a grey band crosses a divided chocolate spot beyond the middle. Hind wings angulated behind, greyish white with a grey shade across the middle.

Antennæ of the male notched like a saw, ciliated, light brown; palpi small, chestnut-brown; head of the same colour, moderately smooth; collar light chestnut; in front of it is a raised, sharp, paler ridge; thorax very pale grey, dotted with dark grey, scales of the shoulder-lappets long and loose; abdomen smooth, the basal portion grey-white, the hinder yellowish-white, all dusted with black, and barred with small black streaks on each segment; lateral and anal tufts pale yellow-brown. Fore wings rather elongated and pointed; costa almost straight to near the tip where it becomes arched; apex decidedly pointed; hind margin immediately below it sharply hollowed to above the middle, whence it is oblique and almost straight to the anal angle; dorsal margin straight; colour dusky white shaded and

dappled with greyish-brown; along the costa are three small oblique cloudy brown-black spots, from each of which arises, at a sudden angle, an oppositely oblique obscure slender brownish transverse line; outside the third of these is a broad better-defined grey stripe arising at the costa from a larger chocolate spot, and enclosing in its middle portion a considerable chocolate-black spot which is obscurely broken up into several portions; the concave portion of the hind margin below the apex is sharply edged with chocolate-black, the cilia here being smoky-black; the remainder dusky-white. Hind wings not broad, decidedly angulated or tailed, the hind margin tending outward toward this sharp angle; greyish-white dusted with purplish-grey; central spot small and obscure, grey; across the middle is a broad faint pale purplish-grey band, and another, still fainter, and composed of short rippled lines, occupies the hind-marginal region; cilia white. Female similar.

Under side very pretty, fore wings yellowish-white, sprinkled all over with short, fine, transverse, purplish-brown lines and dots; costa shaded with light brown; beyond the middle is a broad straight band of dark brown and chocolate-brown, becoming bright chestnut at the costa; the concavity below the apex is blackened, as on the upper side. Hind wings yellowish-white, dusted with brown; central spot black. Before it is a slender yellow-brown transverse line, beyond it a broad yellow and chestnut transverse stripe; hind margin dotted with black; cilia white. Body and legs pale grey-brown.

Not very variable, but in the collection of Mr. P. M. Bright is a specimen nearly white, with the markings very pale; and others with the sub-apical costal spot large and deeper black; or with a broad slate-coloured band; of this last form one is exceedingly dark. Mr. Sydney Webb possesses one almost devoid of the rippled or irrorated grey dusting; another wholly irrorated with this, but without the dark spots; and others intermediate between this and the type

while a specimen in the collection of Mr. S. J. Capper is almost devoid of the usual markings.

On the wing in May and the beginning of June, and as a partial second generation in July or August.

LARVA smooth, elongated, very slightly stouter behind; head rounded, pale green, with a large cloudy black spot on each lobe; body extremely pale green, with faint longitudinal parallel red-brown lines, and upon the sides of the fourth, fifth, and seventh segments a large purple-brown blotch.

Or, the purple-brown blotches extended to other segments, and all joined to a broad similar dorsal stripe.

Or, the purple-brown colour extended to the whole dorsal and sub-dorsal surface, with the blotches of the same extending down to the pale green undersurface, the legs also brown, and head black.

Mr. Buckler figures a variety entirely devoid of purple-brown markings, the whole surface pale glaucous green without definite markings, except that the usual raised spots, which in the other forms are obscure, are here black and distinct; there are three or four faint black streaks on its sides, and the large spots on the lobes of the head are black.

June, and again in August and September, on blackthorn, sallow, and alder.

PUPA rather slender, stoutest in the middle from thickening of the wing-covers, which are rather swollen, moderately glossy, and faintly pitted and sculptured with a few incised lines; limb-covers but little sculptured and very closely appressed; antenna-covers ornamented with broad cross-sculpture, which seems as though arranged over pectinations; dorsal region much pitted, except the hinder edge of each segment, where is a narrow smooth band; all these parts dark chestnut, except the wing-covers, which are darker; abdominal segments dark purple-brown, strongly pitted in broad bands; cremaster small, conical, armed with a pair of

short spines so closely pressed together as to look like a single one with a small fork at its tip. The skin seems to be unusually thick and strong, and is lined inside with a white membrane. In a slight cocoon in the ground. In this condition through the winter.

The moth hides in the daytime among the leaves of bushes, its food-plants especially, and may readily be beaten out, when it flies vigorously. Its natural time of flight, however, is at dusk, and doubtlessly again late at night, since it will come to a strong light.

An exceedingly local species and usually scarce; apparently confined to woods. Not very scarce in the New Forest and the Isle of Wight, and found rather frequently in Kent, especially in the small woods which crown or skirt the hills near the coast. Formerly it was common at Coombe Wood, Surrey, but has long disappeared from that locality; rare in Sussex and Middlesex, less so in Dorset and Devon; very rare in Suffolk, and only once taken—by Dr. A. W. Carlier—in Norfolk. Further north it has been found near Windermere, in Westmoreland; but apparently not beyond. In Wales it is recorded only at Neath, Glamorganshire, by Sir J. T. D. Llewellyn; and not in Ireland.

Abroad it has a wide range throughout Central Europe, the northern half of Italy, Dalmatia, Livonia, Finland, Central and Eastern Russia, Bithynia, Armenia, Tartary, Japan, China, and even Vancouver Island in North America.

2. **M. notata**, L.—Expanse $1\frac{1}{8}$ to $1\frac{1}{4}$ inch. Fore wings excavated below the apex; yellowish-white, dusted with light brown; three yellow-brown transverse lines arise from reddish-brown costal spots; beyond is another costal spot, large, squared, chocolate colour; and beneath it a darker spot, distinctly divided into five sections by white lines. Hind wings faintly dusted and barred with pale brown.

Antennæ of the male rather short, notched, light brown; palpi very small, yellow-brown, as is the head; neck paler

and faintly ridged; collar bright reddish-brown; thorax rather smooth, brownish-white; the shoulder-lappets furnished with long scales; abdomen pale drab, dusted with black and spotted along the dorsal region with brown-black; lateral and anal tufts small. Fore wings moderately broad, arcuate; costa arched; apex pointed; hind margin beneath it concave to above the middle, there angulated, and rounded off below; dorsal margin straight; colour yellowish-white, dusted all over with pale brown; from three obscure cloudy chestnut spots on the costal margin arise equidistant pale brown transverse slender lines or cloudy threads; beyond the third spot is a much larger and more conspicuous rich chestnut or chocolate costal spot; from this proceeds an excessively faint, yellowish-brown, cloudy transverse band, in which lies a large chocolate-black spot divided into five sections by slender white lines; the concavity below the apex is edged with pale chocolate, the cilia arising from it being purplish-brown, the rest yellowish-white. Hind wings angulated behind and rather tailed, the anterior margin rounded, the hinder straight, to the tail: colour and dusting as in the fore wings; central spot a reddish dot; before it is a faint yellow-brown transverse line, beyond it a broader similar band or shade of faint lines; hind margin edged with a red-brown line; cilia yellowish white. Female similar.

Underside very pretty; fore wings white, dusted with pale chestnut; all the wings have a central red-black spot or dot, before which is a slender chestnut transverse line, and beyond it a broad similar rich stripe, its inner edge the darkest; hind margins edged and dashed with the same. Body brownish-white, legs pale brown.

Extremely constant in colour and markings, but a specimen taken a good many years ago near Folkestone, by Mr. Purdey, has a repetition of the compound spot of the fore wings upon the hind. Forty years ago, when this species was common at West Wickham Wood, Kent, a recurrent malformation, having three wings only, was there not scarce—I have taken

three such in one day—in some the right hind wing was aborted, in others the left. This occurred in both broods—yet I found no such specimen among those reared from the egg. Mr. J. Jenner Weir met with an example flying, although both its hind wings were absent.

On the wing at the end of May and in June, and in a second generation at the end of July and in August.

LARVA elongate, third segment a little swollen laterally; head small, flattened, shining black; face whitish; skin highly polished; thirteenth segment bristly and furnished with three very minute anal points; colour uniform shining hazel-brown, with a series of pale green blotches in a line with, and surrounding, the inconspicuous brownish spiracles; a faintly paler ventral stripe, and blackish ventral spots; legs black.

Or, bright green shaded on each segment with light yellowish-brown, having ill-defined light brown or grey sub-dorsal lines, between which and the spiracular line is a series of oblique brown blotches; sides of second and third segments purplish-brown; face green; undersurface greenish, clouded with pale brown, and having a faintly paler central band.

Or, yellowish-green, with very faintly indicated paler dorsal, sub-dorsal, spiracular, and ventral stripes; head *green* with a black dash on the summit of each lobe; legs purplish-black; first pair of prolegs purple; anal prolegs green.

Or, pale green, the sides broadly shaded with hazel-brown, forming an irregular series of pale green dorsal and lateral blotches; head and legs black, face green; both pairs of prolegs tinged with dark purplish-brown; under-surface purplish or hazel-brown, with a paler or greener central stripe.

All these varieties graduate into each other. (C. Fenn.)

End of June and beginning of July; another generation at the end of August and in September; on birch, willow,

and, according to Mr. Buckler, on blackthorn. Hoffmann adds alder and willow. It is but a short time in the larva state, feeding up sometimes in three or four weeks.

PUPA moderately stout, anal extremity spiked; very dark red-brown; wing-cases with an olive tinge. In a loose cocoon on the surface of the ground. (C. Fenn.) In this condition through the winter.

The moth hides in the daytime principally in birch bushes and small birch trees, from which it is readily disturbed by the beating-stick. It seems especially to frequent heath-carpeted woods. Often it rests close to the ground. Its natural time of flight is dusk, and probably also late at night, but it is very local and usually scarce, and its habits have not been very thoroughly observed. It inhabits woods in Kent, Sussex, Dorset, and Devon, is rare in Cornwall, and has once been recorded in Surrey; a single capture seems also to have been made in Cambridgeshire, and it is scarce in Suffolk and Gloucestershire. Rather common in heathy woods in Staffordshire and Cheshire, but I find no record for other parts of England; and in Wales only Glamorganshire. In Scotland it re-appears in Inverness-shire and Ross-shire; and in Ireland it was said by the late Mr. E. Birchall to be plentiful at Killarney, but I can find no recent confirmation of this statement.

Abroad it is widely distributed over Central and the temperate portions of Northern Europe, South Lapland, Finland, Northern Italy, Greece, Southern Russia, Eastern Siberia, Armenia, and the mountain regions of Central Asia. Moreover, it appears to be known under the names of *enotata*, Packard, and *amulataria*, Walk, in North America, in Florida, Texas, and the Washington Territory.

3. **M. liturata**, L.—Expanse $1\frac{1}{4}$ inch. Fore wings very slightly arcuate; pale slate-grey, with three darker transverse lines arising from black costal spots; beyond the third is a

yellowish-tawny band and a chocolate costal spot. Hind wings brownish-white, shaded with grey, and similarly banded.

Antennæ of the male distinctly notched, ciliated, light brown; palpi small, and with the head, dull reddish-brown, as also are the collar and a raised ridge on the neck; thorax slate-grey, smooth, except the loosely raised shoulder-tufts; abdomen smooth, whitish-grey, with small lateral and anal tufts. Fore wings rather pointed; costa slightly but regularly arched; apex bluntly angulated; hind margin below it very slightly retuse and decidedly oblique, rounded off at the anal angle quite to the dorsal margin, which is also a little rounded; colour light slate-grey minutely dappled with very pale grey; three black-brown spots on the costa give rise to slender black-brown transverse lines, which are rather accentuated on the nervures; immediately following the third is a broad complete stripe of light cloudy chocolate, widened at the costa, where its anterior portion is orange-yellow, and the hinder portion is formed into a red-brown crescent; beyond this to the apex the costa is narrowly dark chestnut, barred by two pale yellow streaks; extreme hind margin faintly dotted with black; cilia glossy grey. Hind wings moderately broad; hind margin rounded, except a somewhat blunt angle, which cannot be called a tail, near the middle; colour paler slate-grey, similarly dappled; central spot black; before it is a faint, slender, and very straight transverse reddish-black line, beyond it another, more sinuous, which is closely followed by a broad obscure pale tawny transverse stripe, edged again outside by another dark line; cilia pale slate-grey. Female similar, sometimes a little paler.

Underside pale grey dusted with yellow-brown; each wing has a central black dot preceded by one, and traces of another, slender, transverse, reddish-grey stripe, and followed by a third, which is merely the inner margin of a broad yellow band which shades off toward the apex of the wing to

tawny-brown, and in the fore wings is suddenly extended. in part. to the hind margin; above this the apical area is silvery-white dotted with brown and purple-grey; cilia all yellowish white clouded and dashed with smoky-black. Body and legs pale drab; tarsi pale brown.

Usually very constant in colour and markings, though the slate-grey of the wings fades rapidly even during life; but there seems to be a tendency to variation in the Western and Midland districts; a striking variety found occasionally in Delamere Forest, Cheshire, is of a suffused, smoky black-brown colour with the lines obscured, but the tawny transverse band ill-defined and extended toward the costa into a rusty blotch. A very striking example of this form is lent me by Mr. F. N. Pierce. A somewhat similar variation has been obtained by Mr. F. C. Woodforde in Salop. A specimen in the collection of Mr. S. J. Capper has the three transverse lines of the fore wings and two upon the hind wings much intensified; and the late Mr. W. G. Blatch took at Knowle, near Birmingham, one which has upon the fore wings *four* such lines.

On the wing in June and July, or even occasionally as early as the end of May; and as a very partial second generation, in favoured localities, in August and September.

LARVA rather slender, smooth and even in thickness; head rounded, green, the lobes edged and barred with black; body dark green; dorsal line indistinctly darker, darkest at the divisions of the segments; subdorsal lines, two in number, white, the lower edged with a very dark green spiracular line, below which is a more slender similar line; under-surface and legs paler green. When younger lighter green with *three* white subdorsal lines and a yellowish white line below the spiracles. The resemblance of this larva to a little bundle of leaves of its food plant is, at all ages, extraordinary.

July and August, possibly sometimes in September and

October, on Scotch fir (*Pinus sylvestris*), feeding upon the leaves. Abroad it is said to feed also upon Silver fir (*P. picca*) and even upon juniper.

PUPA short, stout, and compact, the wing-cases the thickest portion, but not much swollen; limb-covers very smooth and level, but the antenna-covers sculptured so as to indicate the joints; the first abdominal incision of the segments rather deep, the other segments edged behind by a slightly raised blackish rim; cremaster triangular and running to a sharp point but apparently without bristles—unless in my examples they are broken off; eyes rather prominent, black; wing-cases and limb-covers black-brown; dorsal and abdominal regions red-brown, except that the edges of the segments are darker; only moderately glossy. Among fallen fir-needles upon the ground, beneath the surface-masses.

The moth sits by day in the branches of the fir trees, or in windy weather upon the trunks, or among the undergrowth of bramble, whortleberry, or fern underneath. Usually restless in such a position, and in sunny weather on the alert, and ready to fly up into the branches if disturbed. Doubtless it flies at dusk, but as this is necessarily around the branches of the fir trees it is rarely taken at that time. Later at night it will sometimes visit flowers, and has been taken upon those of *Knaulia arvensis*. Apparently to be found in fir woods throughout England, though usually in small numbers. It is said, however, to be common in Saver-nake Forest, Wilts, and also in Somerset and Gloucestershire; but I find no record of it in Wales—where it *must* occur. In Scotland it is found rarely in Berwickshire and Roxburghshire; more frequently in Perthshire, where it used to be rather common on Moncrieffe Hill; also in the Edinburgh district; in Ayrshire, and other portions of the Clyde Valley; and in the Counties of Inverness, Ross, Aberdeen, Kincardine and Moray. In Ireland it is widely distributed, through Dublin County, Wicklow, Waterford, Cork, Kerry, Kilkenny,

Galway, Roscommon, Meath, Westmeath, and to Slieve Donard in County Down. Abroad its range is through Central and Northern Europe, the North of Spain and Italy, Central and Eastern Russia, Armenia, and Eastern Siberia.

Genus 9. **HALIA.**

Antennæ of the male shortly pectinated; palpi small; head and thorax rough; abdomen smooth and slender; fore wings broad, blunt, and faintly retuse; hind wings broad but elongated, very faintly angulated behind.

We have but one species.

1. **H. wauaria**, *L.*; **wavaria**, *F.*—Expanse $1\frac{1}{4}$ inch. Very pale smoky-brown, or smoky-white, often with a violet tinge; costa of fore wings ornamented with four wedge-shaped red-black spots, the second making a **V** with a similar discal spot. Hind wings plain, smoky-white.

Antennæ of the male pectinated with short stout ciliated teeth, dark brown; palpi of the same colour, short and blunt; head ashy-grey, a small ridge behind it whitish-grey; thorax rather roughened with raised scales, smoky-brown; abdomen similar, the anal tuft darker, lateral tufts minute. Fore wings broad and slightly retuse, costa arched, especially so toward the apex, which is bluntly angulated; hind margin below it faintly hollowed; then filled out and gently rounded off; dorsal margin rather full; colour very pale smoky-brown, or smoky-white, shading into smoky-grey along the hind margin and anal angle; four chocolate-black spots lie upon the costal margin, the first narrow, and in some specimens originating a faint, obscure, and rather direct first line; the second thicker and extended so as to join an elongated black discal spot, and from it make a sharp **V**-shaped angle; the third narrow, and originating a faintly dotted, and obscure second line; the fourth large and somewhat rhomboid, its lower portion black; costa otherwise yellowish with chocolate dotting; from the second costal spot across the opening of

the **V**-mark is usually an obscure and incomplete cloudy black central shade, and on the opposite or dorsal margin is a pair of chocolate dots indicating its termination; cilia smoky-brown. Hind wings broad and elongated; hind margin very obtusely angulated; smoky brownish-white, the hind margin more clouded with smoke-colour; central spot round, black; on the dorsal margin are two blackish-brown dashes with some freckling of the same colour; cilia smoky-brown. Female similar but with simple antennæ.

Underside of the fore wings smoky-brown; costa more ochreous, much barred with smoky-black; dorsal margin white. Hind wings yellowish-white abundantly dusted and rippled with pale purplish-brown, and having a cloudy band of the same before the hind margin; central spot black; cilia yellow-brown, spotted with purplish-brown. Body and legs grey-brown; tibiæ dotted with white.

Rather variable in the ground colour, from dusky-white to uniform pale smoky-brown; and also in respect of the central shade, which often is so much blackened as to confuse the **V**-mark, or to make with it a triangle, or else to join together the first and second costal spots; occasionally this central shade distinctly crosses the wing, forming a full curve on its way; in other specimens it is very indistinct, and the dark streak which should complete the **V** is absent, or even the discal spot or streak is detached from the costal spot. Mr. Sydney Webb has in his collection a specimen in which the first and second lines are distinct and well-formed, the central shade blackened, and the discal and second costal spots far removed from each other; another of a uniform smooth smoky black-brown without markings, except that the chocolate colour asserts itself along the costa; hind wings smoky-black. In South-west Yorkshire Mr. Porritt constantly finds it with the fore wings clouded along the hind margin with smoky-black, which shades off inward to the middle of the wings.

On the wing in July and August.

LARVA stout, bristly, the usual spots raised, the incisions of the segments well marked, otherwise moderately cylindrical; head lead-coloured and streaked with black; colour of the body yellowish-green or some darker shade to bluish-green, violet-brown, purple-brown, or leaden-brown; dorsal line white, double, both duplicates very slender; sub-dorsal lines thread-like. waved. white; spiracular stripe broad, yellow, rather extended into a blotch in the middle of each segment; usual raised spots black and conspicuous, each furnished with a short bristle; undersurface yellow-green or deep green, with two conspicuous. yellowish or white, longitudinal lines; legs black; prolegs dull brownish-black. Sometimes the slender longitudinal lines are smoky-black instead of white. The green individuals usually become reddish-brown just before entering the pupa state.

April to June on gooseberry, currant—especially red-currant—and other species of *Ribes*; feeding at night on the younger shoots, and resting by day on the undersides or petioles of leaves. Especially attached to gooseberry or currant bushes which are trained against a wall, sometimes stripping these of their leaves, while bushes standing in open ground are comparatively neglected. Very timid and sensitive, dropping instantly when touched, and remaining suspended by a thread. Dr. A. G. Butler has noted that this larva is distasteful to frogs.

PUPA moderately stout, anal extremity with a single terminal bristle; colour red-brown or blackish-brown. Subterranean, not enclosed in a cocoon. (C. Fenn.)

The winter is passed in the egg-state.

The moth hides during the day in gooseberry and currant bushes, or sits on a wall in their vicinity, and is easily disturbed, flying quickly about the bushes to a similar hiding-place. At dusk it is lively and active. From the nature of its food-plants it is almost confined to gardens, and is in them often very common; and its larva destructive, stripping

the leaves so as seriously to injure the crop of fruit and the growth of the plant. Apparently common throughout England, except in Cornwall, in which county it seems to be absent to the west of Bodmin. Doubtless also common throughout Wales, though I have no records except my own at Pembroke. In Scotland it seems to be common in gardens in the lower districts—though not on the hills—to Moray and West Ross. In Ireland it is scarce, but has been taken at Howth near Dublin, in Wicklow, Kerry, Galway, Westmeath Sligo, Tyrone, and Derry. Abroad commonly in Central Europe, the temperate portions of Northern Europe, Northern Italy, Greece, Dalmatia, and Southern Russia.

END OF VOL. VI.

ADDITIONS AND CORRECTIONS.

Vol. iv. p. 194.—My information as to the pupa of **Hadena glauca**, that “though the larva changes to pupa underground, it forms *no* cocoon,” proves to be erroneous. Mr. G. O. Day has, most kindly, sent me, from Knutsford, pupæ of this species *in* their cocoons. The latter are soft but well formed and moderately tough; one in moss, the rest thickly covered with earth. Mr. E. Newman’s remark that “each abdominal segment has a ring of strong rough spines, somewhat similar to those of the goat-moth,” is well confirmed so far as the first three abdominal segments are concerned, the rings of spines thereupon being quite remarkably rough, and projecting outwards to a degree unusual in *Noctua* pupæ.

Vol. v. p. 163.—**Leucania unipuncta**. Mr. Day tells me that he secured a specimen of this rare moth on the Carnarvonshire coast, North Wales, on August 28, 1897.

Vol. v. p. 255.—**Amphipyra tragopogonis**. The existence of this species in North Wales is now certain, Lord Boston having taken several specimens in the Isle of Anglesey.

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PLATE CCXXXIII.

FIG. 1. Hoporina croceago, male.

1*a.* female.

1*b.* larva, Mr. W. Buckler.

2. Dasycampa rubiginea.

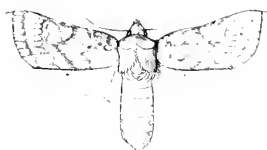
2*a.* var. Mr. Sydney Webb.

2*b.* " " "

2*c.* larva, Mr. W. Buckler

3. Cerastis erythrocephala, Mr. S. Webb.

3*a.* var. glabra, Mr. S. Webb.



1

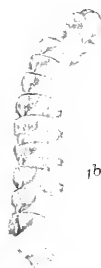


3

1^a



2



1^b



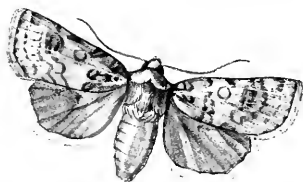
2^a



2^b



2^c



3



3^a

PLATE CCXXXIV.

FIG. 1. *Cerastis vaccinii*.

- | | | | |
|------------------------------------|----|---------|------------------------|
| 1 <i>a</i> . | ,, | .. | var. mixta. |
| 1 <i>b</i> . | ,, | .. | ,, spadicea. |
| 1 <i>c</i> . | ,, | .. | larva, Mr. W. Buckler. |
| 2. | ,, | ligula. | |
| 2 <i>a</i> . | .. | .. | var. |
| 2 <i>b</i> . | ,, | .. | ,, |
| 2 <i>c</i> . | ,, | .. | larva, Mr. W. Buckler. |
| 3. <i>Scopelosoma satellitia</i> . | | | |
| 3 <i>a</i> . | ,, | .. | var. |
| 3 <i>b</i> . | ,, | .. | ,, Mr. S. Webb. |
| 3 <i>c</i> . | ,, | .. | larva, Mr. W. Buckler. |



1



1^c



1^a



1^b



2



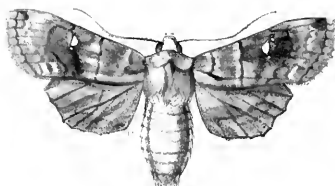
2^a



2^b



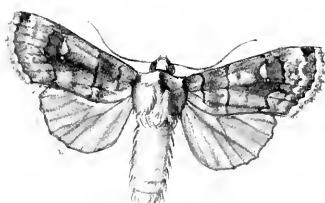
3^c



3



2^c



3^a



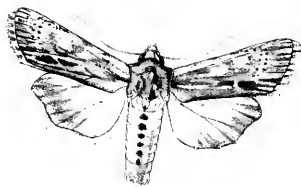
3^b



PLATE CCXXXV.

FIG. 1. *Xylina semibrunnea*, male.

- | | | | |
|-------------|----|--------------|------------------------|
| 1 <i>a.</i> | .. | .. | female. |
| 1 <i>b.</i> | .. | .. | larva Mr. W. Buckler. |
| 2. | .. | petrificata. | |
| 2 <i>a.</i> | .. | .. | var. |
| 2 <i>b.</i> | .. | .. | „ Mr. S. Webb. |
| 2 <i>c.</i> | .. | .. | larva, Mr. W. Buckler. |
| 3 | .. | conformis, | Mr. Evan John. |
| 3 <i>a.</i> | .. | .. | larva, Mr. W. Buckler. |
| 4 | ., | lambda, | Mr. S. Webb. |



1.



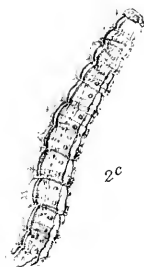
1^a



1^b



2



2^c



2^a



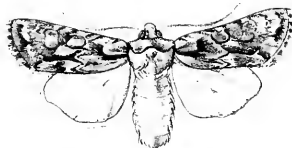
2^b



3^a



3



4.

PLATE CCXXXVI.

FIG. 1. *Xylina rhizolitha*.

1*a.* var.

1*b.* larva, Mr. W. Buckler.

2. *Xylocampa lithoriza*, male.

2*a.* female.

2*b.* larva, Mr. W. Buckler.

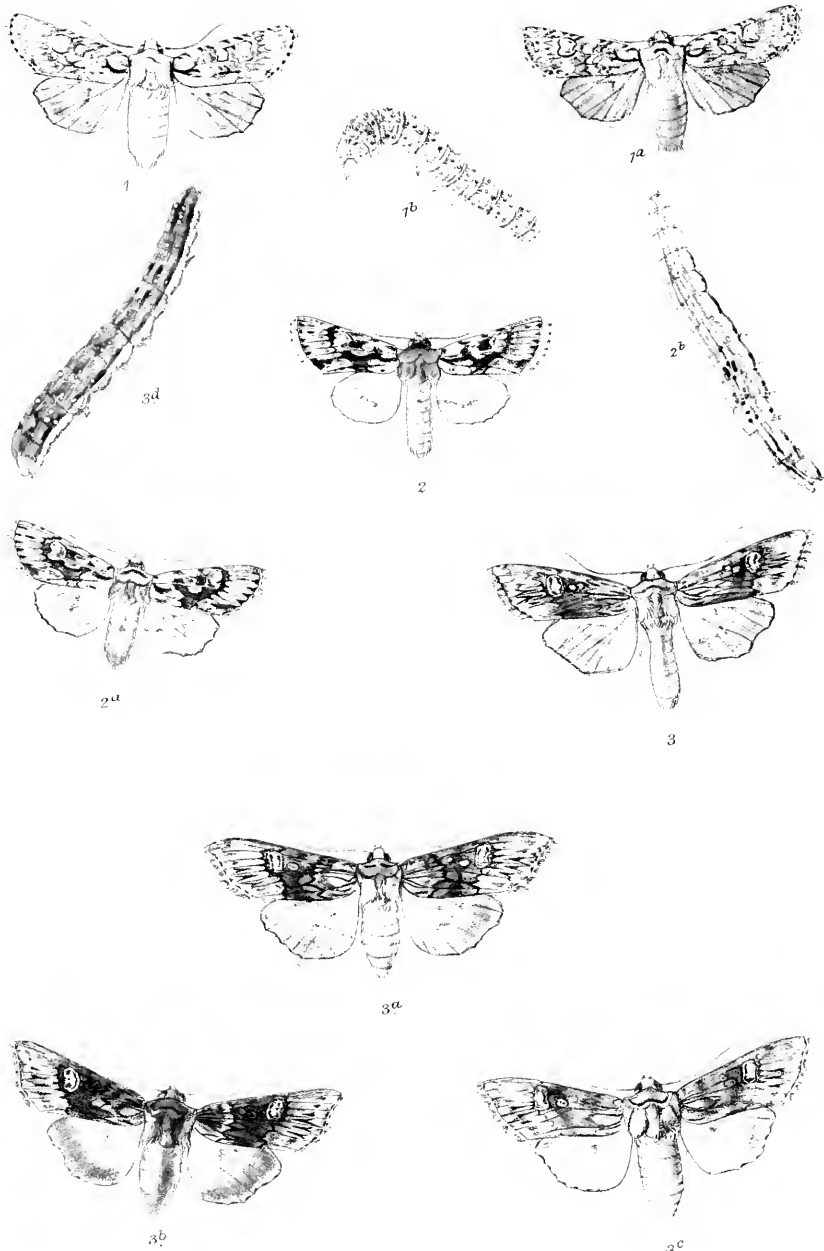
3. *Lithomia solidaginis*, male.

3*a.* female.

3*b.* var. Mr. G. T. Porritt.

3*c.* Cannock Chase, Mr. F.
C. Woodforde.

3*d.* larva, Mr. W. Buckler.



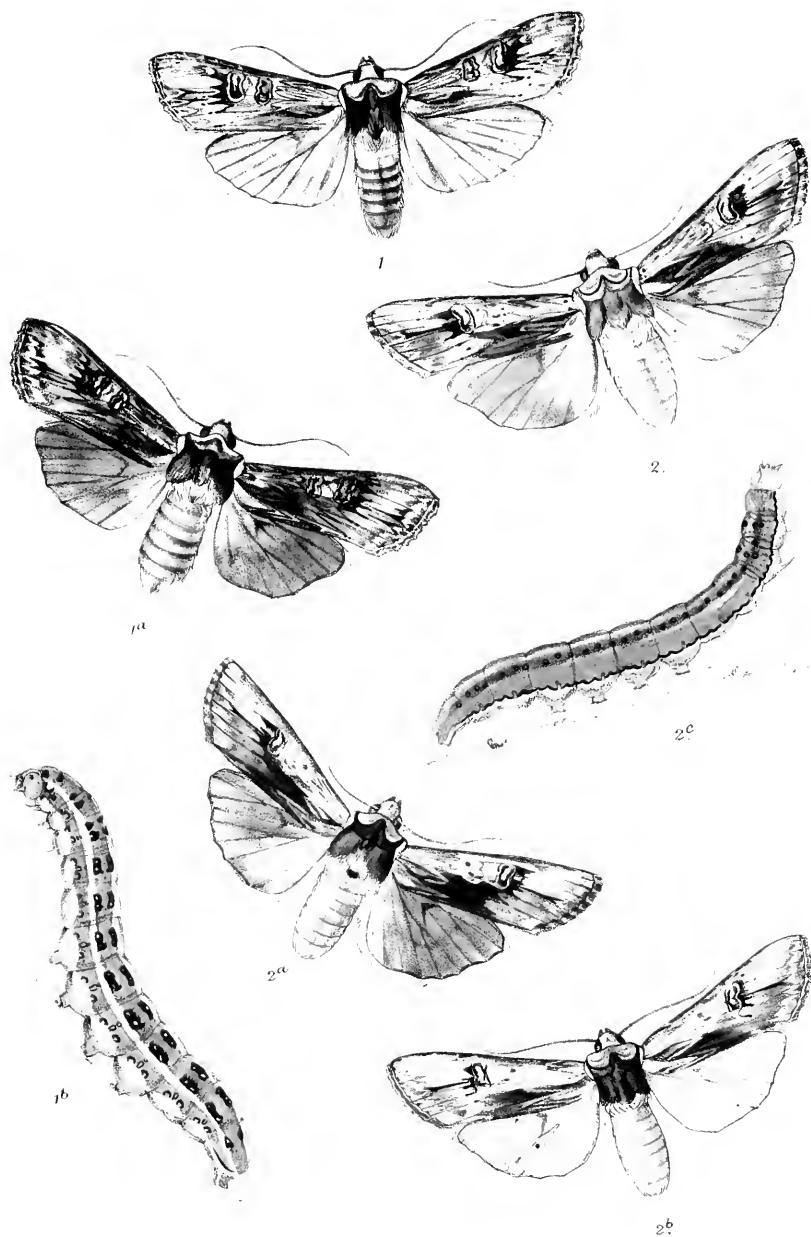
R. Morgan del et lith.

Vincent Brooks, Day & Son, Lith.

PLATE CCXXXVII.

FIG. 1. *Calocampa exoleta*.

- | | | | |
|--------------|---|---|-------------------------|
| 1 <i>a</i> . | „ | „ | var. Dr. H. H. Corbett. |
| 1 <i>b</i> . | „ | „ | larva, Mr. W. Buckler. |
| 2. | „ | | <i>vetusta</i> . |
| 2 <i>a</i> . | „ | „ | var. Scotland. |
| 2 <i>b</i> . | „ | „ | „ South England. |
| 2 <i>c</i> . | „ | „ | larva, Mr. W. Buckler. |



R. Morgan del, et lith.

Vincent Brooks Day & Son Ltd Imp

L. Reeve & Co London

PLATE CCXXXVIII.

FIG. 1. *Cucullia verbasci*, male.

- | | | | |
|--------------|---|------------------------|--------------------------|
| 1 <i>a</i> . | „ | „ | female. |
| 1 <i>b</i> . | „ | „ | larva, Mr. W. Buckler. |
| 2. | „ | <i>scrophulariae</i> , | male, Dr. F. D. Wheeler. |
| 2 <i>a</i> . | „ | „ | female, „ „ |
| 2 <i>b</i> . | „ | „ | larva, Mr. W. Buckler. |
| 3. | „ | <i>lychnitis</i> , | male. |
| 3 <i>a</i> . | „ | „ | female. |
| 3 <i>b</i> . | „ | „ | larva, Mr. W. Buckler. |



1



1^a



1^b



2



2^a



2^b



3^b



3.



3^a

PLATE CCXXXIX.

FIG. 1. *Cucullia asteris*, male.

- | | | | |
|--------------|---|---|------------------------------------|
| 1 <i>a</i> . | „ | „ | female. |
| 1 <i>b</i> . | „ | „ | larva, Mr. W. Buckler. |
| 2. | „ | | <i>gnaphalii</i> . |
| 2 <i>a</i> . | „ | „ | larva, Mr. W. Buckler. |
| 3. | „ | | <i>absynthii</i> , male. |
| 3 <i>a</i> . | „ | „ | female. |
| 3 <i>b</i> . | „ | „ | larva, Mr. W. Buckler. |
| 4. | „ | | <i>abrotani</i> , Dr. P. B. Mason. |

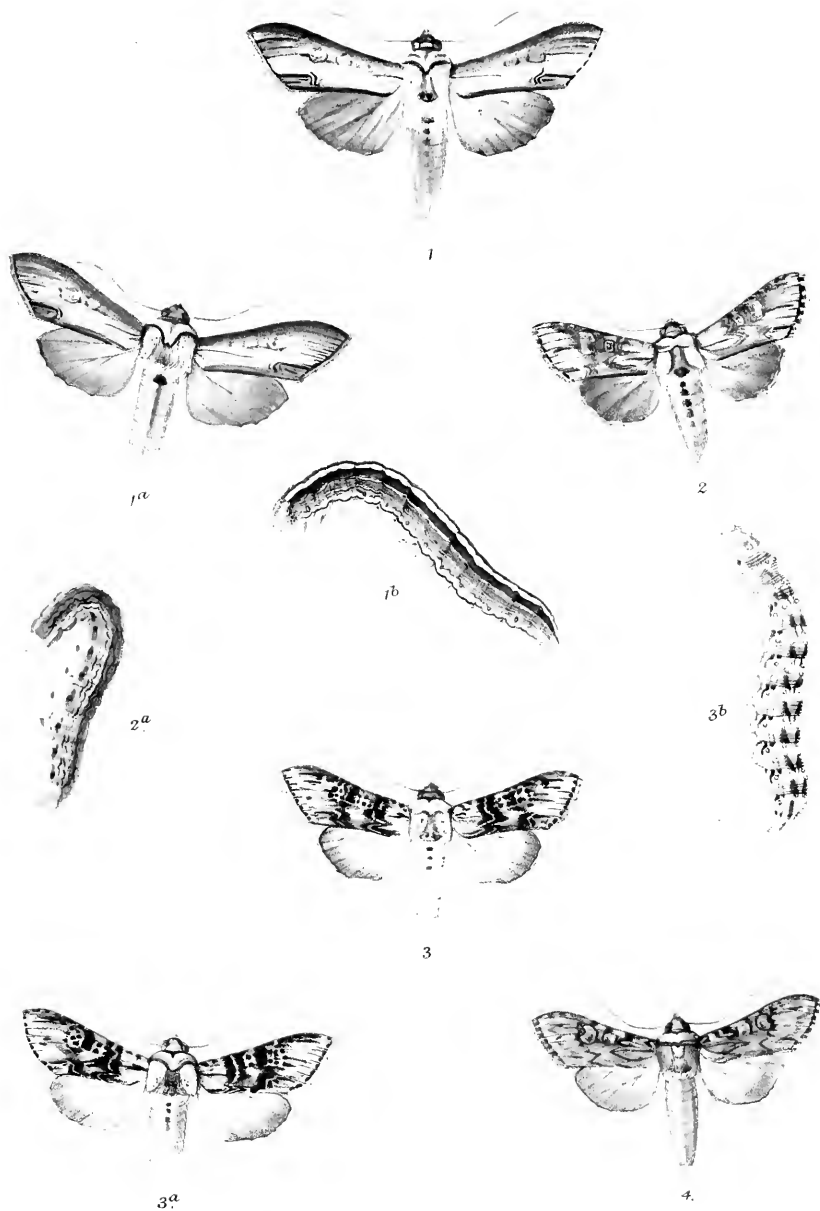


PLATE CCXL.

FIG. 1. *Cucullia chamomillæ*, male.

1*a.* „ „ female.

1*b.* „ „ larva, Mr. F. C. Woodforde.

2. „ *umbratica*, male.

2*a.* „ „ female.

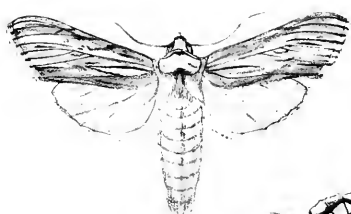
2*b.* „ „ larva, Mr. W. Buckler.

3. *Plusia illustris*.

4. „ *chryson*, male.

4*a.* „ „ female.

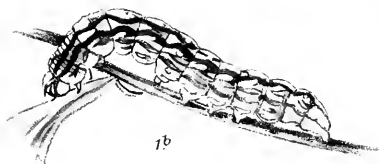
4*b.* „ „ larva.



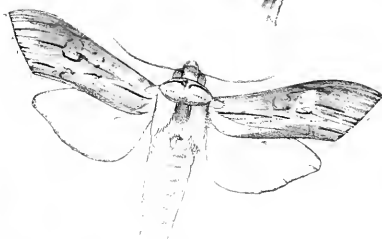
1



1a



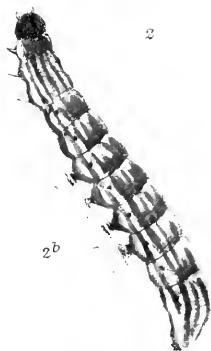
1b



2



2a



2b



3



4b



4



4a

PLATE CCXLI.

FIG. 1. *Plusia chrysitis*, male.

1*a.* „ „ female.

1*b.* „ „ var.

1*c.* „ „ larva, Mr. W. Buckler.

2. „ moneta, male.

2*a.* „ „ female.

2*b.* „ „ larva.

3. „ bractea, male.

3*a.* „ „ female.

3*b.* „ „ larva, Mr. W. Buckler



1



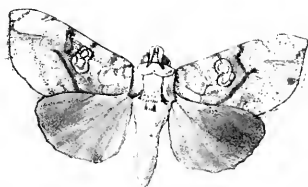
1^a



1^b



1^c



2



2^a



2^b



3^b



3



3^a

PLATE CCXLII.

FIG. 1. *Plusia festucae*, male.

1*a.* „ „ female.

1*b.* „ „ larva, Mr. W. Buckler.

2. „ *pulchrina*, male.

2*a.* „ „ female.

2*b.* „ „ larva, Mr. W. Buckler.

3. „ *iota*, male.

3*a.* „ „ female.

3*b.* „ „ larva, Mr. W. Buckler.



1



1^a



1^b



2



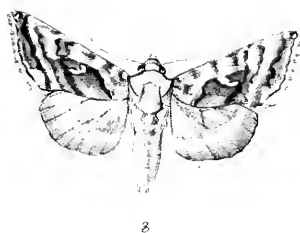
2^a



2^b



3^b



3

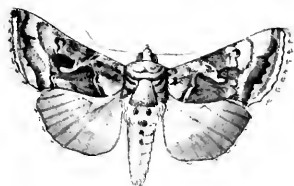


3^a

PLATE CCXLIII.

FIG. 1. *Plusia gamma*, male.

- | | | | |
|--------------|---|-----|--------------------------------|
| 1 <i>a</i> . | „ | „ | female. |
| 1 <i>b</i> . | „ | „ | var. |
| 1 <i>c</i> . | „ | „ | small form, Mr. G. T. Porritt. |
| 1 <i>d</i> . | „ | „ | var. Devon, Mr. F. J. Hanbury. |
| 1 <i>e</i> . | „ | „ | larva, Mr. W. Buckler. |
| 2. | „ | ni. | Mr. W. R. Jeffrey. |
| 3. | „ | | interrogationis. |
| 3 <i>a</i> . | „ | „ | var. N. of Ireland. |
| 3 <i>b</i> . | „ | „ | larva, Mr. W. Buckler. |



1.



1^a



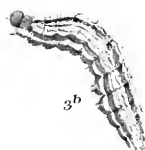
1^b



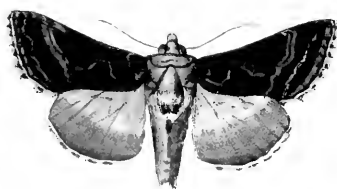
1^c



2.



3^b



1^d



1^e



3



3^a

PLATE CCXLIV.

- FIG. 1. *Habrostola urticae*, male.
1*a*. „ „ female.
1*b*. „ „ larva, Mr. W. Buckler.
2. „ triplasia, male.
2*a*. „ „ female.
2*b*. „ „ larva, Mr. W. Buckler.
3. *Chariclea delphinii*.
4. „ marginata, male.
4*a*. „ „ female, var.
4*b*. „ „ dwarf, Mr. G. T. Porritt.
4*c*. „ „ larva, Mr. W. Buckler.



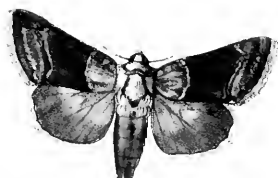
1



1^a



2



2^a



3



1^b



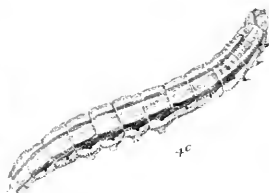
4



2^b



4^a



4^c



4^b

PLATE CCXLV.

FIG. 1. *Heliothis armigera*, male.

1*a.* „ „ female.

1*b.* „ „ larva.

2. „ *peltigera*, male, Mr. F. C. Woodforde.

2*a.* „ „ female.

2*b.* „ „ larva, Mr. W. Buckler.

3. „ *dipsacea*, male.

3*a.* „ „ female.

3*b.* „ „ larva, Mr. W. Buckler.

4. „ *scutosa*, Mr. W. H. Thorntwaite.



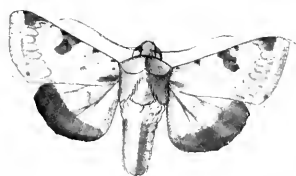
1.



1^a



1^a



2



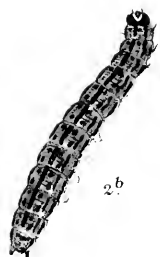
2^a



3^a



3.



2^b



3^a



4

PLATE CCXLVI.

FIG. 1. *Heliodes arbuti*, male.

1*a.* „ „ female.

1*b.* „ „ larva, Mr. W. Buckler.

2. *Acontia luctuosa*, male.

2*a.* „ „ female.

2*b.* „ „ larva, Mr. W. Buckler.

3. „ *solaris*.

4. „ *venustula*, male.

4*a.* „ „ female.

4*b.* „ „ larva, Mr. W. Buckler.



1.



1^a



1^b



2



2^a



2^b



3



4^b



4



4^a

PLATE CCXLVII.

FIG. 1. *Hydrelia argentula*, male.

1*a.* ,, ,, female.

1*b.* ,, ,, larva, Mr. W. Buckler.

2. ,, *uncana*, male.

2*a.* ,, ,, female.

2*b.* ,, ,, larva, Mr. W. Buckler.

3. *Thalpochares ostrina*.

4. ,, *parva*.

5. ,, *paula*.



1



1^a



2



2^a



3



1^b



2^b



4



5

PLATE CCXLVIII.

FIG. 1. *Agrophila sulphuralis*, male.

1*a.* „ „ female.

1*b.* „ „ var.

1*c.* „ „ larva, Mr. W. Buckler.

2. *Erastria fuscula*, male.

2*a.* „ „ female.

2*b.* „ „ larva, Mr. W. Buckler.

3. *Phytometra ænea*, male.

3*a.* „ „ female.

3*b.* „ „ var.

3*c.* „ „ „

3*d.* „ „ larva, Mr. W. Buckler.



1



1^a



1^b



2



1^c



2^a



3



3^a



3^b



3^d



3^b



3^c

PLATE CCXLIX.

FIG. 1. *Bryophila glandifera*, male.

1a.	..	..	female.			
1b.	..	..	var. Devon, Mr. F. C. Woodforde.			
1c.	.,	.,	.,	Devon, Rev. C. F. Benthall.		
1d.	..	..	..	..	..	..
1e.	..	..	..	..	..	..
1f.	.,	..	..	..	..	..
1g.	..	..	..	..	..	..
1h.	..	..	..	..	..	..
1i.	.,	.,	..	Cambridge, Mr. W. Warren.		
1j.	..	..	larva, Mr. W. Buckler.			



1.



1^a



1^b



1^c



1^d



1^e



1^f



1^h



1^j



1^g



1^l

PLATE CCL.

FIG. 1. *Bryophila perla*, male.

1*a.* ,, ,, female.

1*b.* ,, ,, var.

1*c.* ,, ,, ,, Mr. S. J. Capper.

1*d.* ,,

1*e.* ,, ,, larva, Mr. W. Buckler.

2. *Anarta melanopa*, male, Mrs. Fraser.

2*a.* ,, ,, female, ,,

2*b.* ,, ,, larva, Mr. W. Buckler.

3. ,, *cordigera*, male.

3*a.* ,, .. female.

3*b.* ,, ,, var.

3*c.* larva, Mr. W. Buckler.

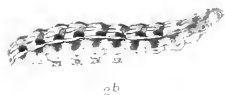


PLATE CCLI.

FIG. 1. *Anarta myrtilli*, male.

1*a.* ,, ,, female.

1*b.* ,, ,, larva, Mr. W. Buckler.

2. *Catephia alchemysta*, Sussex, Mr. W. Borrer.

3. *Sarrothripa revayana*.

3*a.* ,, ,, var.

3*b.* ,, ,, ..

3*c.* ,, ,, ,,

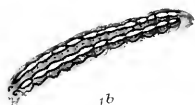
3*d.* ,, ,, ..

3*e.* ,, ,, ..

3*f.* ,, ,, ..



1.



1b



1a



3



3a



2



3'



3c



3d



3e



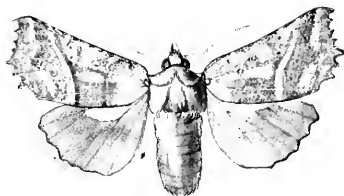
3f

PLATE CCLII.

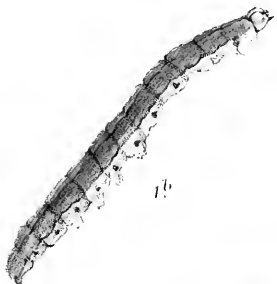
- FIG. 1. *Gonoptera libatrix*, male.
1*a.* „ „ female.
1*b.* „ „ larva, Mr. W. Buckler.
2. *Ophiodes lunaris*.
3. *Catocala fraxini*.
3*a.* „ „ larva, Mr. W. Buckler.



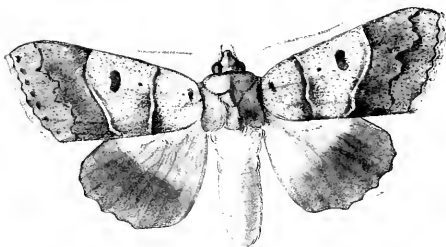
1.



1^a



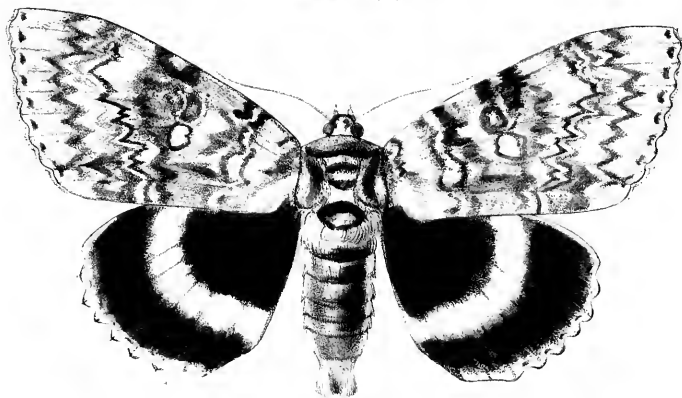
1^b



2.



2^a



3.

PLATE CCLIII.

FIG. 1. *Catocala electa*, Mr. E. Bankes.

2. ,, nupta, male.

2*a.* ,, ,, female.

2*b.* ,, ,, at rest.

2*c.* ,, ,, larva, Mr. W. Buckler.

2*d.* ,, ,, egg (magnified), Mr. E. Wheeler.

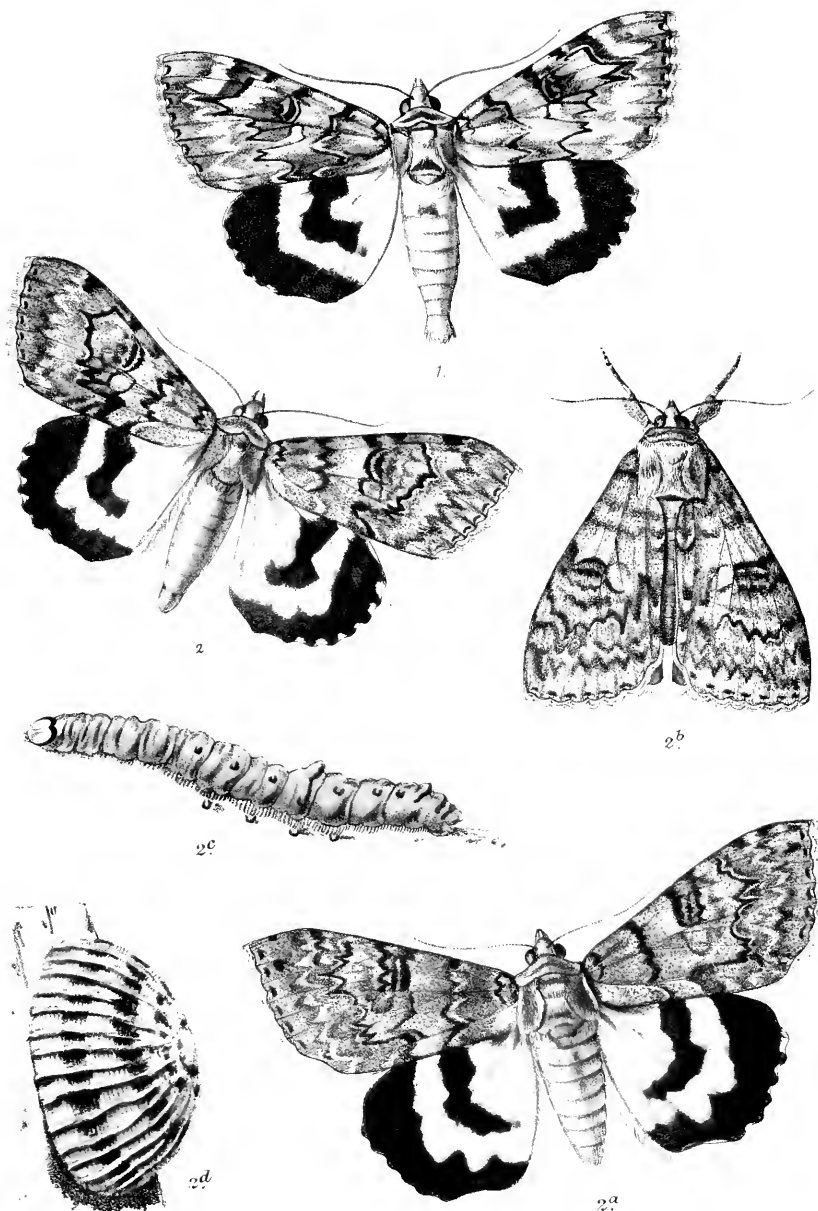
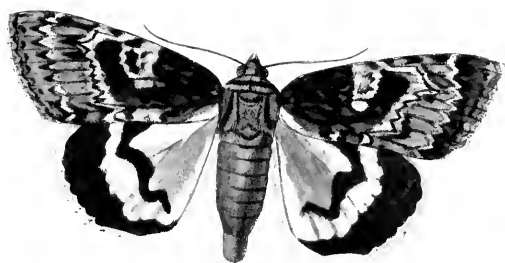


PLATE CCLIV.

FIG. 1. *Catocala sponsa*, male.

- | | | | |
|--------------|---|---------|----------------------------------|
| 1 <i>a</i> . | „ | „ | female. |
| 1 <i>b</i> . | „ | „ | var. Mr. P. M. Bright. |
| 1 <i>c</i> . | „ | „ | larva, Mr. W. Buckler. |
| 1 <i>d</i> . | „ | „ | egg (magnified), Mr. E. Wheeler. |
| 2. | „ | fraxini | „ „ „ |



1.



1d



1c



1a



1b



2

PLATE CCLV.

FIG. 1. *Catocala promissa*, male.

1*a.* „ „ female.

1*b.* „ „ larva, Mr. W. Buckler.

2. *Euclidia mi*, male.

2*a.* „ „ female.

2*b.* „ „ larva, Mr. W. Buckler.

3. „ *glyphica*, male.

3*a.* „ „ female.

3*b.* „ „ larva, Mr. W. Buckler.

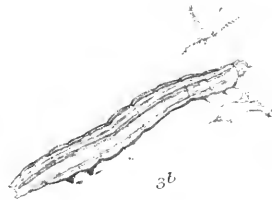
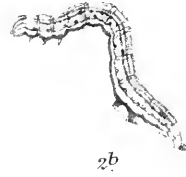
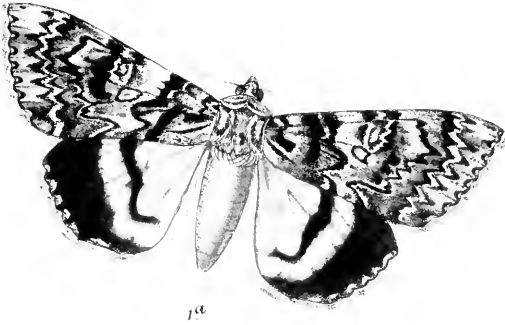
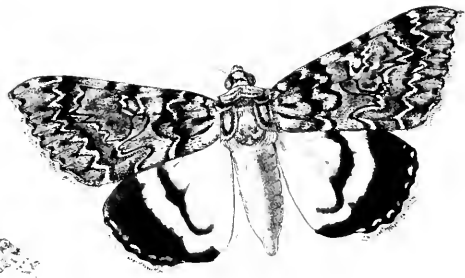


PLATE CCLVI.

FIG. 1. Egg of *Orthosia rufina* (magnified), Mr. E. Wheeler.

2.	„	„	<i>ferruginea</i>	„	„	„
3.	„	„	<i>pistacina</i>	„	„	„
4.	„	„	<i>macilenta</i>	„	„	„
5.	„		<i>Xanthia aurago</i>	„	„	„
6.	„		<i>Xylocampa lithoriza</i>	„	„	„
7.	„		<i>Calocampa exoleta</i>	„	„	„
8.	„		<i>Cucullia verbasci</i>	„	„	„
9.	„		<i>absynthii</i>	„	„	„
10.	„		<i>Plusia interrogationis</i>	„	„	„

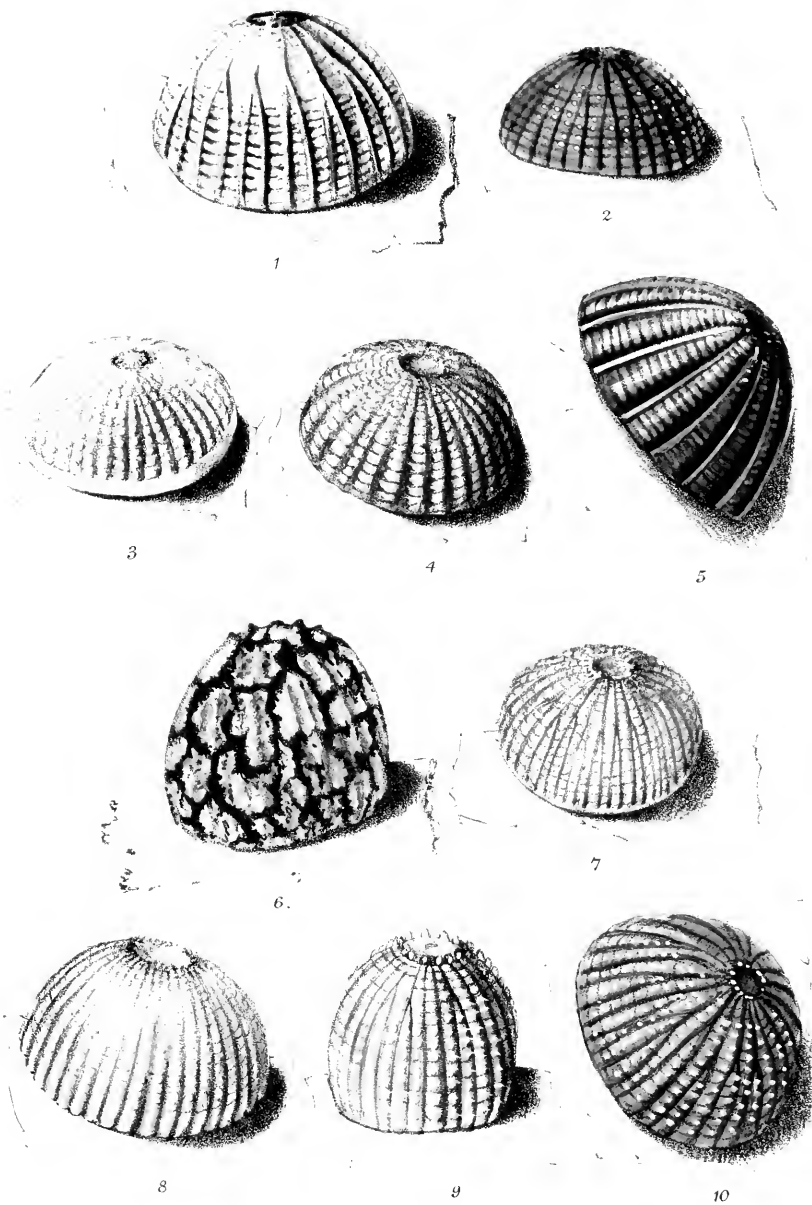
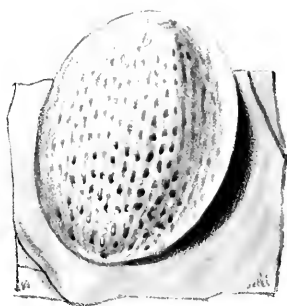


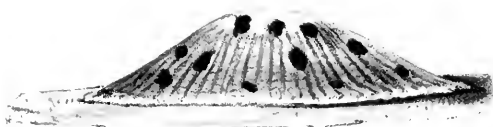
PLATE CCLVII.

- | | | | | | |
|---------|-----------------|---|---|---|--------------------------|
| FIG. 1. | Egg (magnified) | | | | Cymatophora flavicornis. |
| 2. | „ | „ | | | Acronycta megacephala. |
| 3. | „ | „ | „ | | alni. |
| 4. | „ | „ | „ | „ | |
| 5. | „ | „ | „ | | psi. |
| 6. | „ | „ | „ | „ | |
| 7. | „ | „ | „ | | myricæ. |
| 8. | „ | „ | „ | „ | |
| 9. | „ | „ | | | Agrotis cinerea. |
| 10. | „ | „ | | | Noctua festiva. |

* * *From drawings by Mr. E. Wheeler, Bristol.*



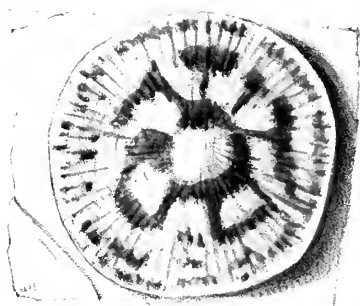
1



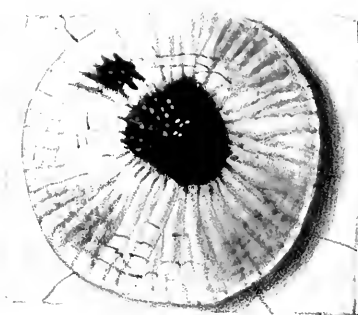
2



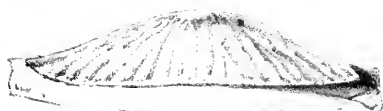
3



4



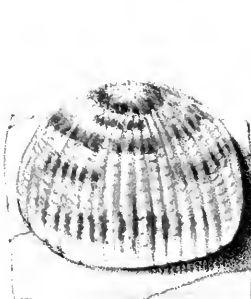
6



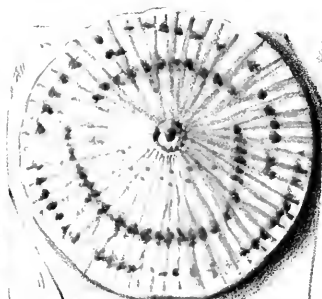
5



7



9



8

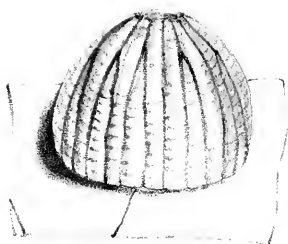


10

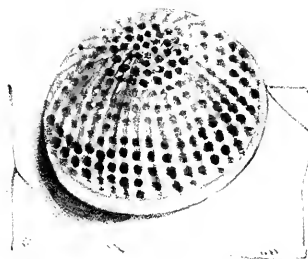
PLATE CCLVIII.

- FIG. 1. Egg (magnified) *Noctua sobrina*.
 2. „ „ *Xylomiges conspicillaris*.
 3. „ „ *Pachetra leucophæa*.
 4. „ „ *Hadena contigua*.
 5. „ „ „ *suasa*.
 6. „ „ *Mamestra persicariæ*.
 7. „ „ *Epunda nigra*.
 8. „ „ *Dasypolia templi*.
 9. „ „ *Polia flavicineta*.
 10. „ „ „ *chi*.

*
* * *From drawings by Mr. E. Wheeler, Bristol.*



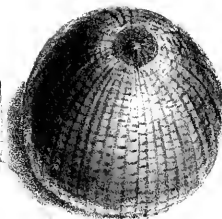
1



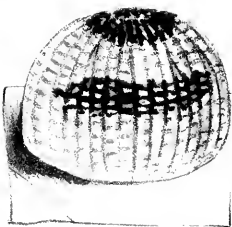
2



3



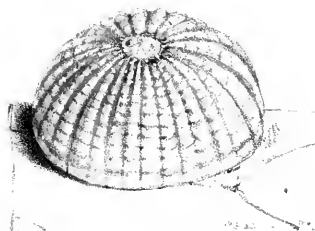
4



5



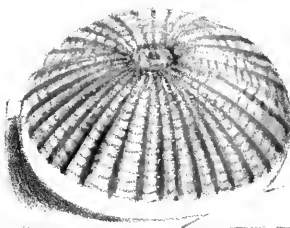
6



7



8



9



10

PLATE CCLIX.

- FIG. 1. Egg (magnified) *Dryobota protea*.
 2. „ „ „ „ (reversed).
 3. „ „ *Chariptera aprilina*.
 4. „ „ *Miselia oxyacanthæ*.
 5. „ „ *Valeria oleagina*.
 6. „ „ *Cerigo cytherea*.
 7. „ „ *Xylophasia polyodon*.
 8. „ „ *Apamea oculatea*.
 9. „ „ *Hyppa rectilinea*.
 10. „ „ *Trachæa atriplicis*.

*
 * * *From drawings by Mr. E. Wheeler, Bristol.*

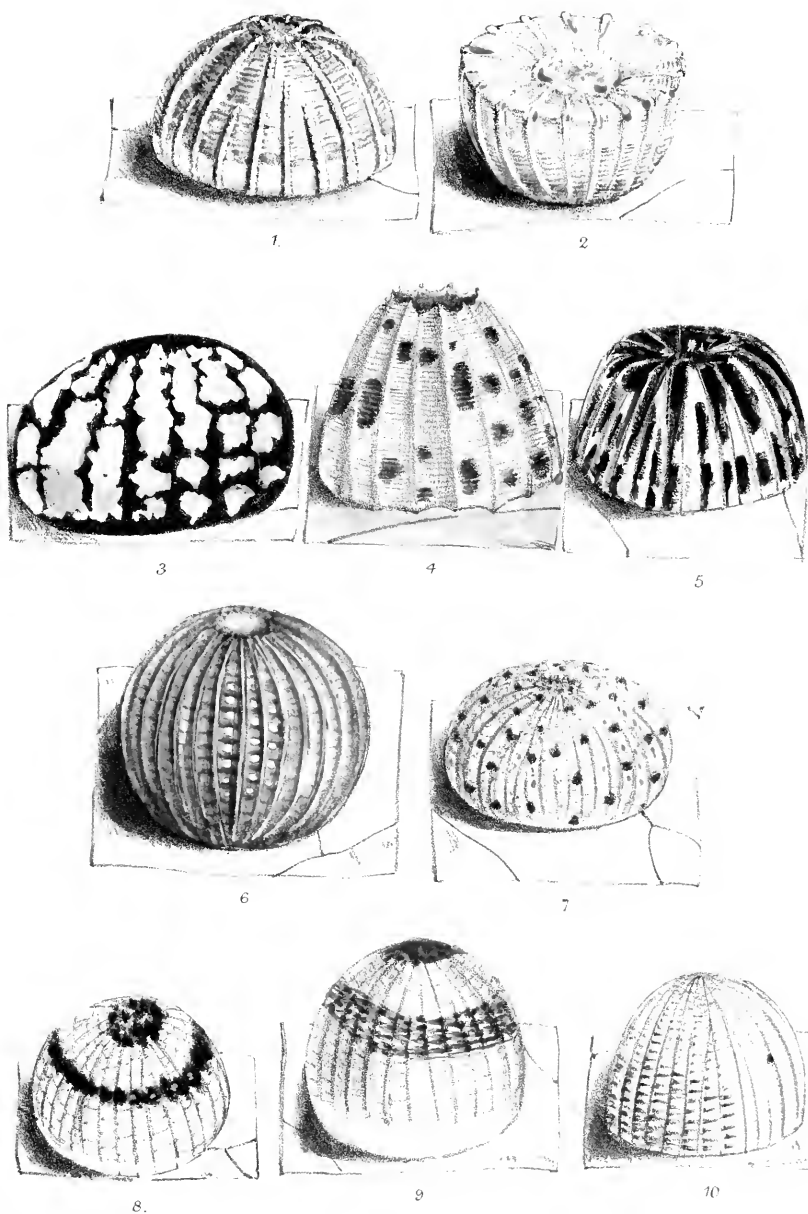


PLATE CCLX.

- | | | |
|---------|-----------------|--------------------------------|
| FIG. 1. | Egg (magnified) | <i>Euplexia lucipara</i> . |
| 2. | „ „ | <i>Nonagria geminipuncta</i> . |
| 3. | „ „ | <i>Tapinostola fulva</i> . |
| 4. | „ „ | <i>Tæniocampa gothica</i> . |
| 5. | „ „ | „ <i>gracilis</i> . |
| 6. | „ „ | „ „ |
| 7. | „ „ | <i>Amphipyra pyramidea</i> . |
| 8. | „ „ | „ „ |
| 9. | „ „ | <i>Toxocampa pastinum</i> . |
| 10. | „ „ | <i>Calymnia affinis</i> . |

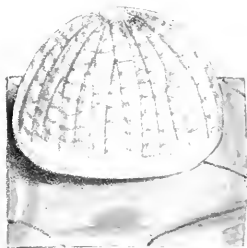
* *From drawings by Mr. E. Wheeler, Bristol.*
* *



1



2



3



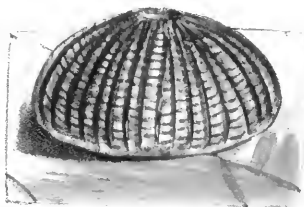
4



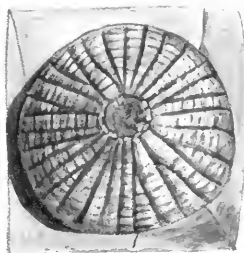
5



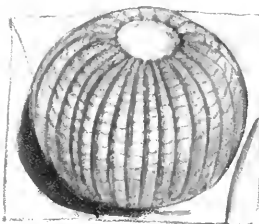
6



7



8



9



10

PLATE CCLXI.

FIG. 1. *Aventia flexula*, male.

1*a.* „ „ female.

1*b.* „ „ larva, Mr. W. Buckler.

2. *Boletobia fuliginaria*.

2*a.* „ „

3. *Madopa salicalis*, male.

3*a.* „ „ female.

3*b.* „ „ larva (Hofmann).

4. *Æthia emortualis*.

5. *Herminia derivalis*, male.

5*a.* „ „ female.



1



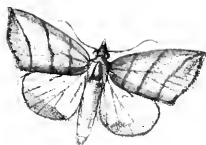
1b



1a



2



3.



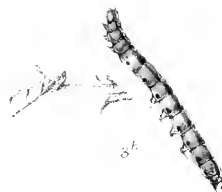
3a



4



2a



3b



5



5a

PLATE CCLXII.

FIG. 1. *Herminia barbalis*, male.

- 1*a.* „ „ female.
- 2. „ *tarsipemalis*, male.
- 2*a.* „ „ female.
- 3. „ *grisealis*, male.
- 3*a.* „ „ female.
- 4. „ *cribralis*, male.
- 4*a.* „ „ female.
- 5. *Schrankia turfosalis*, male.
- 5*a.* „ „ female



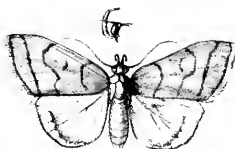
1



1^a



2



2^a



3



3^a



4



5



4^a



5^a

PLATE CCLXIII.

FIG. 1. Hypenodes albistrigalis, male.

1*a.* „ „ female.

2. „ costæstrigalis, male.

2*a.* „ „ female.

3. Bomolocha crassalis, male.

3*a.* „ „ female.

3*b.* „ „ larva.

4. Hypena rostralis, male.

4*a.* „ „ female.

4*b.* „ „ var.

4*c.* „ „ larva.



1



1^a



2



2^a



3



3^a



4^c



4



4^b



4^a



4^b

PLATE CCLXIV.

- FIG. 1. *Hypena proboscidalis*, male.
1*a.* ,, ,, female.
2. *Rivula sericealis*, male.
2*a.* ,, ,, female.
3. *Brephos parthenias*, male.
3*a.* ,, ,, female.
3*b.* ,, ,, larva, Mr. Buckler.
4. ,, notha, male, Major Ficklin.
4*a.* ,, ,, female, ,,
4*b.* ,, ,, larva, Mr. W. Buckler.



1



1^a



2



2^a



3



3^a



3^b



1^b



4



4^a

PLATE CCLXV.

FIG. 1.	Egg (magnified)	Petasia nubeculosa.
2.	.. ..	Diloba cæruleocephala.
3.	.. ..	Ptilophora plumigera.
4.	.. ..	Clostera reclusa.
5.	.. ..	.. .. curtula.
6.	.. ..	Cerura hircuspis.
7.	.. ..	Pygæra bucephala.
8.	.. ..	Pacilocampa populi.
9.	.. ..	.. ..

* * * *From drawings by Mr. E. Wheeler.*

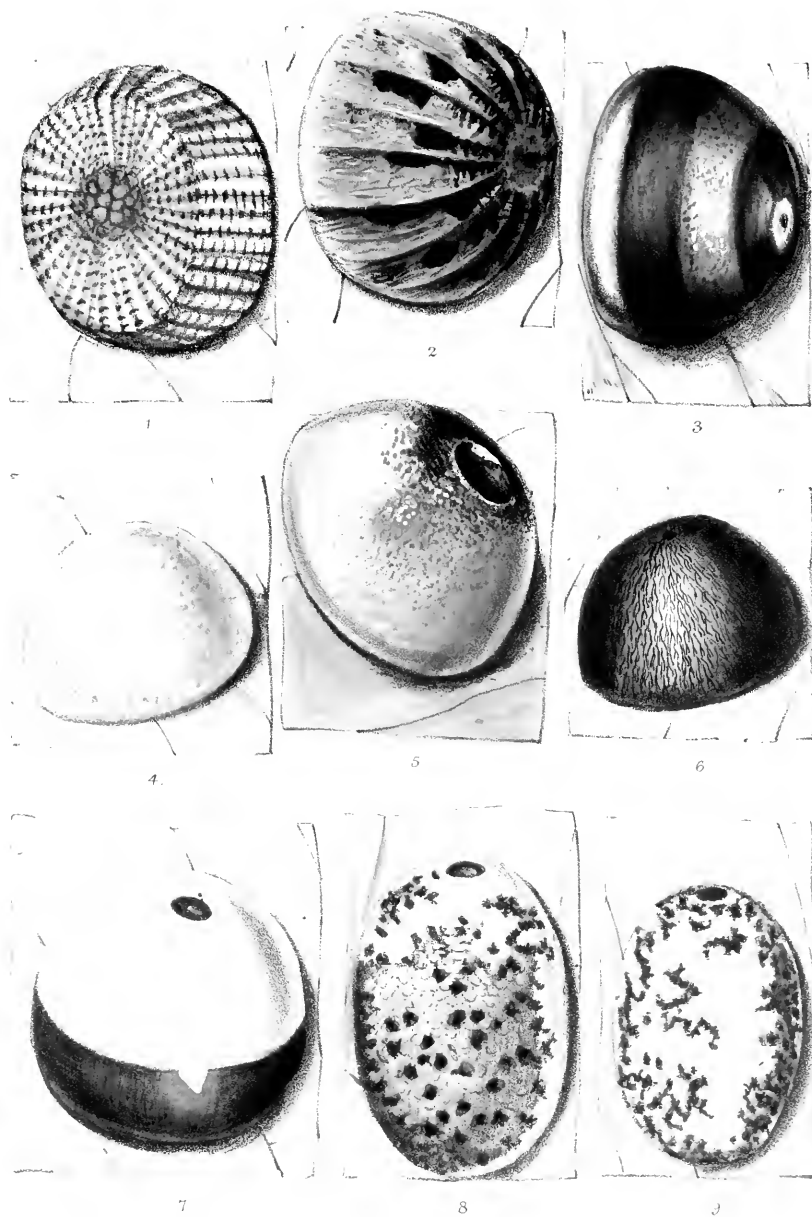


PLATE CCLXVI.

- FIG. 1. Egg (magnified) *Trichiura crataegi*.
 2. „ „ *Liparis dispar*.
 3. „ „ „ „ covered with down.
 4. „ „ „ *salicis*.
 5. „ „ *Dasychira fascelina*.
 6. „ „ *Liparis monacha*.
 7. „ „ *Eriogaster lanestris*.
 8. „ „ *Clisiocampa castrensis*.
 9. „ „ „ *neustria*.

*
* * *From drawings by Mr. E. Wheeler.*

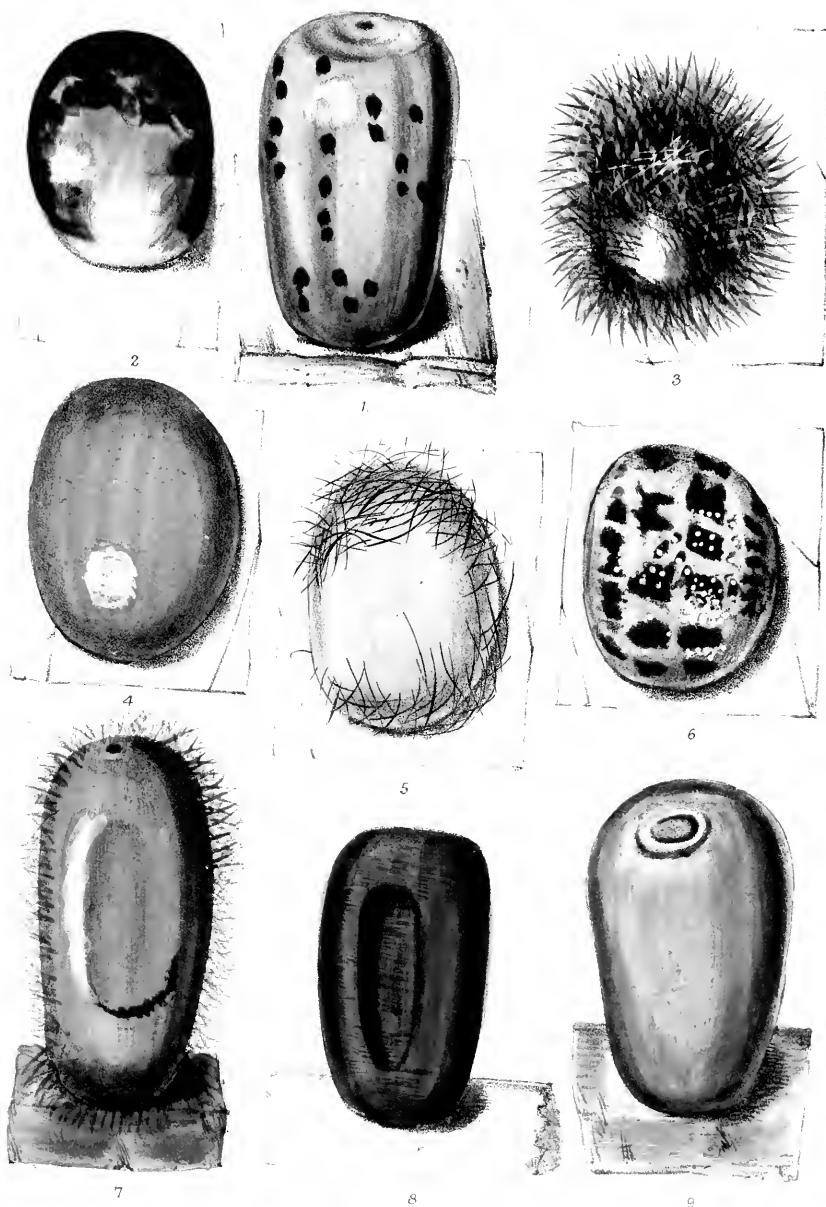


PLATE CCLXVII.

- | | | | |
|---------|-----------------|-----------|--------------------------|
| FIG. 1. | Egg (magnified) | Odonestis | potatoria. |
| 2. | „ | „ | Lasiocampa rubi. |
| 3. | „ | „ | „ quercus. |
| 4. | „ | „ | „ „ var. callunæ. |
| 5. | „ | „ | Endromis versicolor. |
| 6. | „ | „ | Gastropacha quercifolia. |
| 7. | „ | „ | Zeuzera æsculi. |
| 8. | „ | „ | Cossus ligniperda. |
| 9. | „ | „ | Limacodes testudo. |

*
* * *From drawings by Mr. E. Wheeler.*

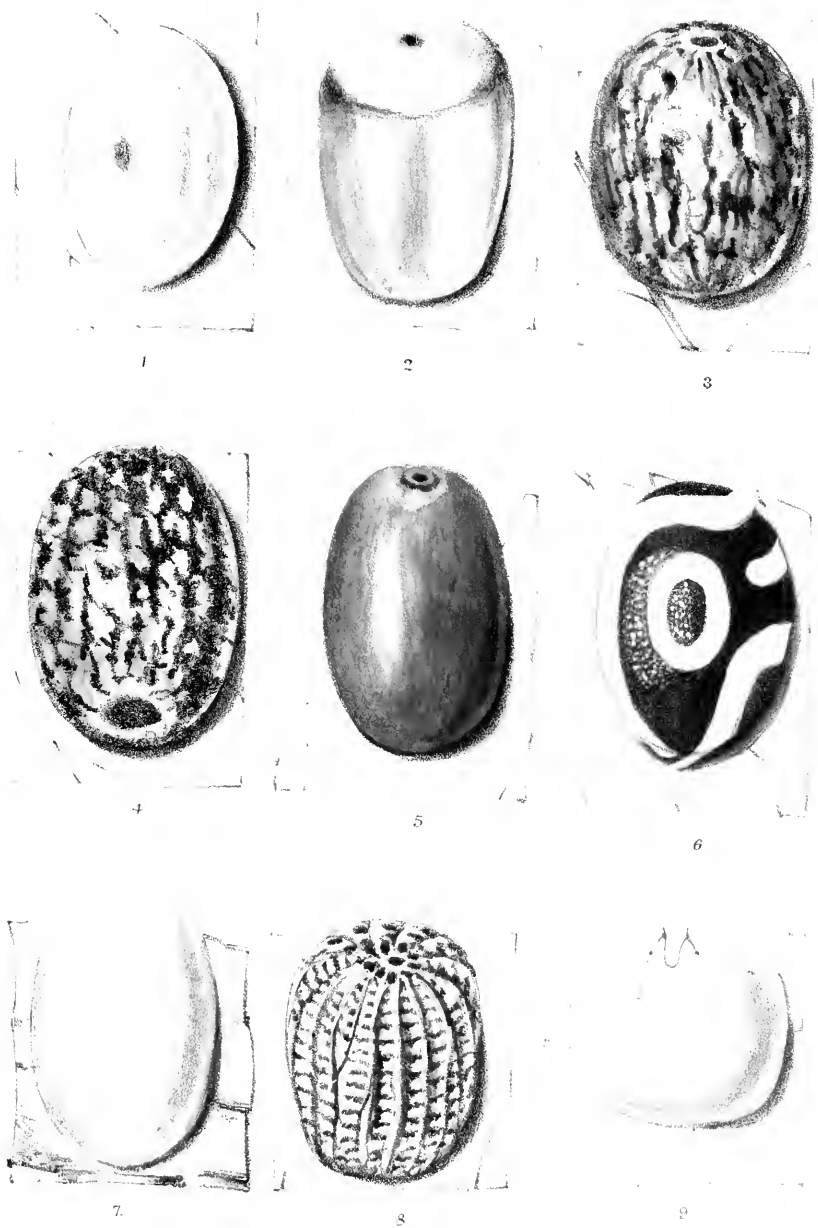


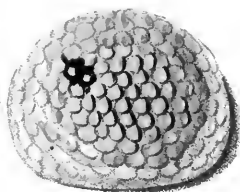
PLATE CCLXVIII.

- | | | | |
|---------|---|-----------------|-------------------------|
| FIG. 1. | | Egg (magnified) | Setina irrorella. |
| 2. | „ | „ | Enistis quadra. |
| 3. | „ | „ | Nemeophila plantaginis. |
| 4. | „ | „ | Hepialus sylvinus. |
| 5. | „ | „ | Macroglossa fuciformis. |
| 6. | „ | „ | Chærocampa Elpenor. |
| 7. | „ | „ | Smerinthus tiliaë. |
| 8. | „ | „ | „ populi. |
| 9. | „ | „ | „ ocellatus. |

* * * *From drawings by Mr. E. Wheeler.*



1.



2.



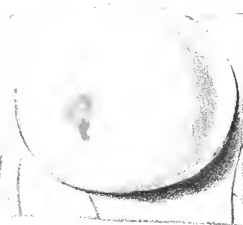
3.



4.



6.



7.



8.



9.



10.

PLATE CCLXIX.

Fig. 1. *Ourapteryx sambucata*, male.

- | | | | |
|------------|---|---|--------------------------|
| 1 <i>a</i> | „ | „ | female. |
| 1 <i>b</i> | „ | „ | male, var., Mr. S. Webb. |
| 1 <i>c</i> | „ | „ | larva, Mr. W. Buckler. |
| 1 <i>d</i> | „ | „ | cocoon. |

2. *Angerona prunaria*, male.

- | | | | |
|------------|---|---|------------------------|
| 2 <i>a</i> | „ | „ | „ var. |
| 2 <i>b</i> | „ | „ | female. |
| 2 <i>c</i> | „ | „ | „ var. |
| 2 <i>d</i> | „ | „ | larva, Mr. W. Buckler. |

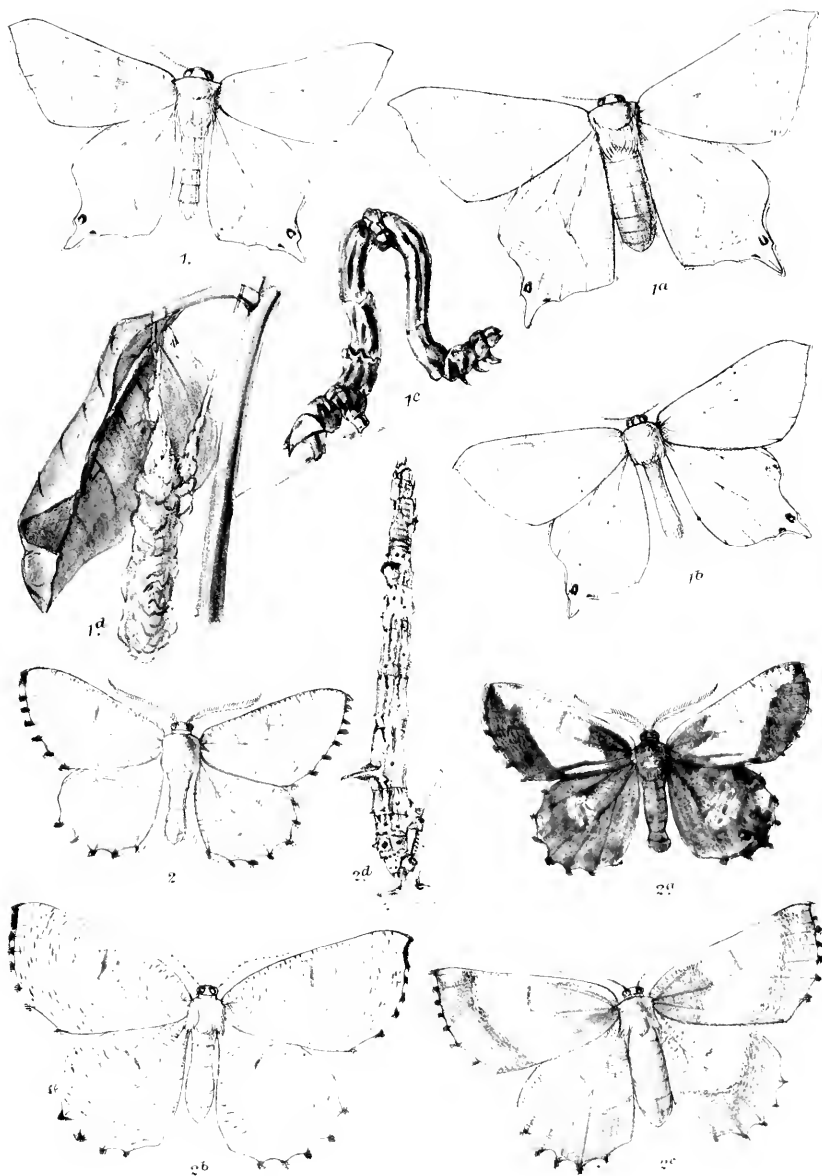


PLATE CCLXX.

FIG. 1. *Angerona prunaria*, male, var. Mr. S. Webb

1 <i>a.</i>	..	..	..	..	..
1 <i>b.</i>	..	..	..	..	..
1 <i>c.</i>	..	..	..	..	..
1 <i>d.</i>	..	..	..	..	..
1 <i>e.</i>	..	..	..	..	..
1 <i>f.</i>	..	..	..	..	..
1 <i>g.</i>	..	..	female	..	..
1 <i>h.</i>	..	..	..	..	..
1 <i>i.</i>	..	..	..	..	..

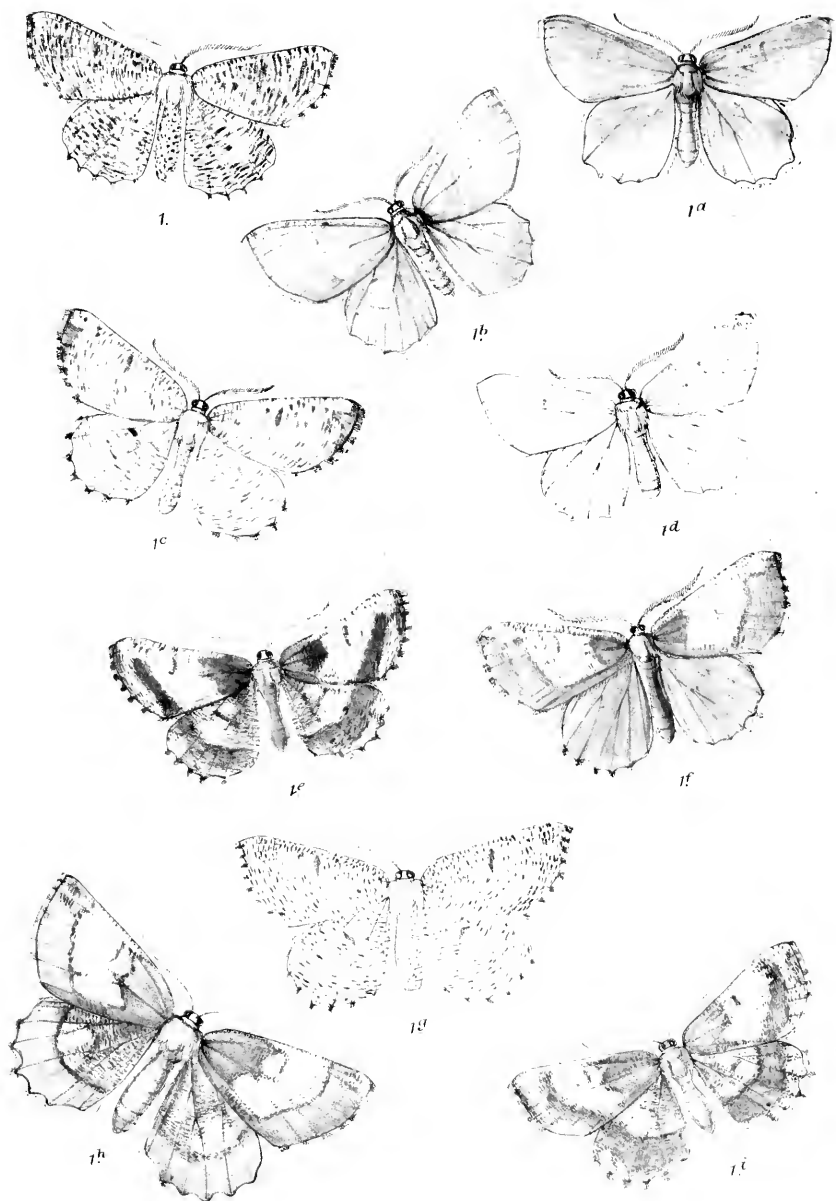


PLATE CCLXXI.

FIG. 1. *Rumia cratægata*, male.

1 <i>a.</i>	„	„	female.		
1 <i>b.</i>	„	„	male, var.		
1 <i>c.</i>	„	„	„	„	Mr. S. J. Capper.
1 <i>d.</i>	„	„	„	„	„
1 <i>e.</i>	„	„	„	„	„
1 <i>f.</i>	„	„	female „	„	
1 <i>g.</i>	„	„	male „	„	Mr. S. Webb.
1 <i>h.</i>	„	„	female „	„	
1 <i>i.</i>	„	„	larva,	„	Mr. W. Buckler.



1



1a



1b



1c



1d



1e



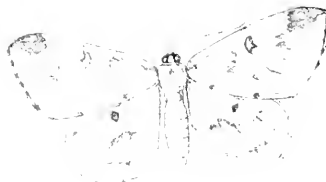
1f



1g



1h



1i

PLATE CCLXXII.

FIG. 1. *Venilia maculata*, male.

1 <i>a.</i>	„	„	female.		
1 <i>b.</i>	„	„	male, var. Mr. S. Webb.		
1 <i>c.</i>	„	„	female „	„	
1 <i>d.</i>	„	„	„	„	„
1 <i>e.</i>	„	„	„	„	„
1 <i>f.</i>	„	„	male „	„	
1 <i>g.</i>	„	„	„	„	„
1 <i>h.</i>	„	„	„	„	<i>quadrifasciata</i> , Mr. S. Webb.
1 <i>i.</i>	„	„	larva, Mr. W. Buckler.		



1



1a



1b



1c



1d



1e



1f



1g



1h



1i

PLATE CCLXXIII.

FIG. 1. *Cabera pusaria*, male.

- 1*a.* female.
- 1*b.* male var. Mr. E. A. Atmore.
- 1*c.* female
- 1*d.* Mr. Sydney Webb.
- 1*e.* male
- 1*f.* rotundaria, Mr. E. A.
Atmore.
- 1*g.* female Mr. G. T.
Porritt.
- 1*h.* intermediate and
unsymmetrical, Mr. E. A. Atmore.
- 1*i.* larva, Mr. W. Buckler.

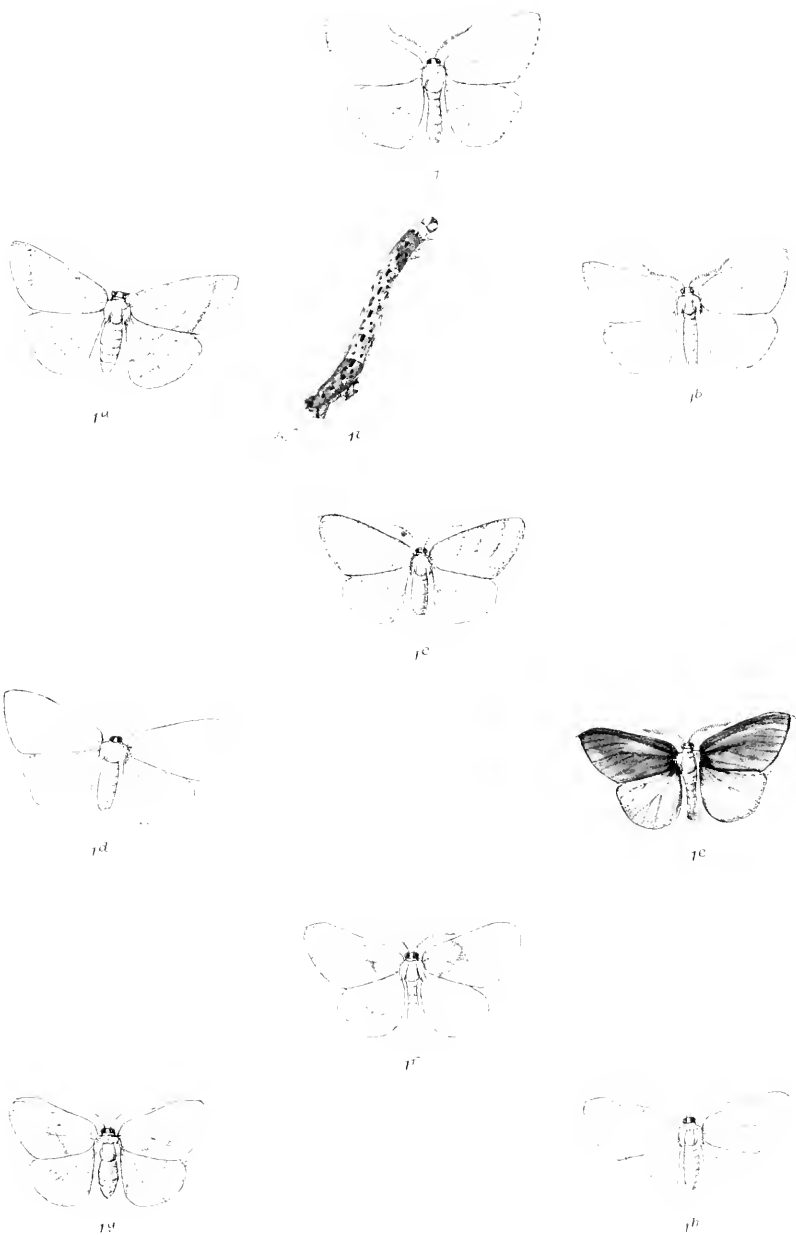


PLATE CCLXXIV.

FIG. 1. *Calbera exanthemaria*. male.

- | | | | |
|--------------|-------------------------------|-------------------|-------------------------------|
| 1 <i>a</i> . | „ | „ | female. |
| 1 <i>b</i> . | „ | „ | male. var. Mr. G. T. Porritt. |
| 1 <i>c</i> . | „ | „ | larva. Mr. W. Buckler. |
| 2. | <i>Bapta temerata</i> . male. | | |
| 2 <i>a</i> . | „ | „ | female. |
| 2 <i>b</i> . | „ | „ | var. Mr. Sydney Webb. |
| 2 <i>c</i> . | „ | „ | larva. Mr. W. Buckler. |
| 3. | „ | <i>taminata</i> . | male. |
| 3 <i>a</i> . | „ | „ | female. |
| 3 <i>b</i> . | „ | „ | var. Mr. Sydney Webb. |
| 3 <i>c</i> . | „ | „ | larva. Mr. W. Buckler. |



1



1a



84



14



2



54



2c



96



3



34



3c



22

PLATE CCLXXV.

FIG. 1. *Aleucis pictaria*.

1*a*. „ „ larva. Mr. W. Buckler.

2. *Macaria alternata*.

2*a*. „ „ var. Mr. S. J. Capper.

2*b*. „ „ „ Mr. Sydney Webb.

2*c*. „ „ larva. Mr. W. Buckler.

3. „ *notata*. male. Mr. F. C. Woodforde.

3*a*. „ „ female „ „

3*b*. „ „ var. „ „

3*c*. „ „ larva, Mr. W. Buckler.

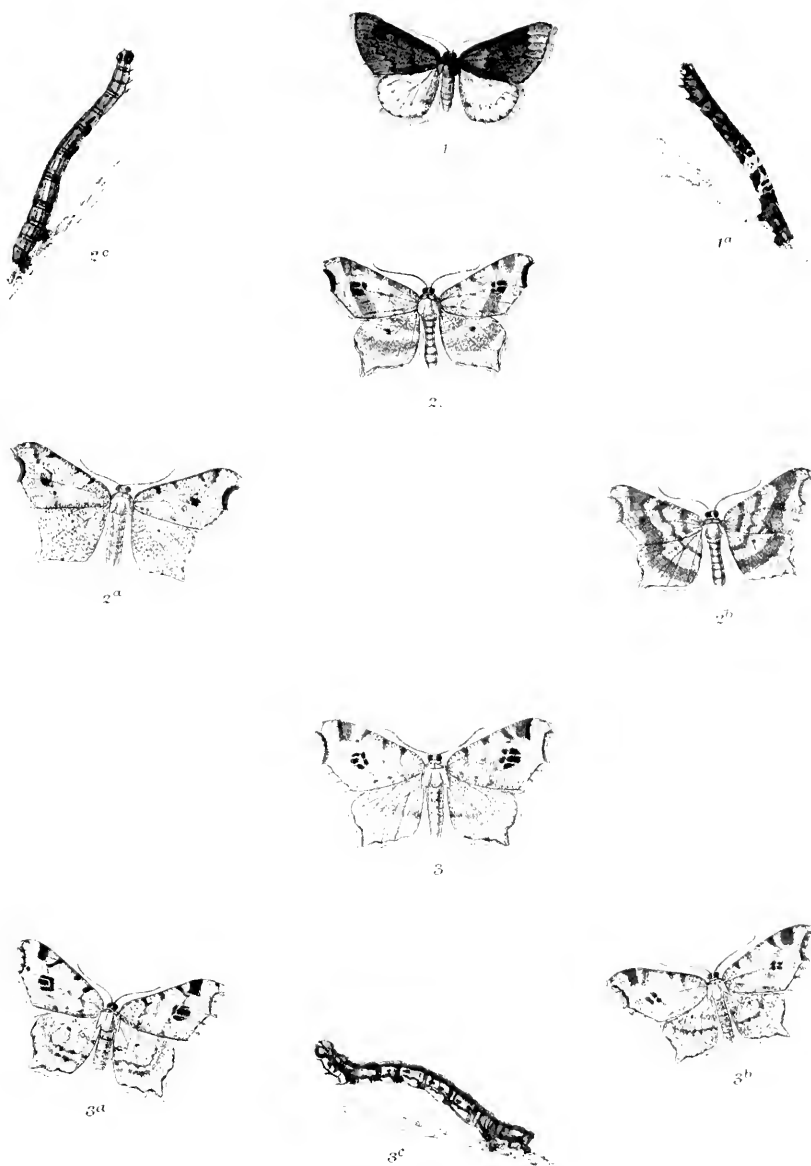


PLATE CCLXXVI.

FIG. 1. *Macaria liturata*, male.

1*a.* female.

1*b.* var. Delamere Forester, Mr. F. N. Pierce.

1*c.* larva, Mr. W. Buckler.

2. *Halia wavaria*, male.

2*a.* female.

2*b.* var.

2*c.* Mr. Sydney Webb.

2*d.*

2*e.* larva, Mr. W. Buckler.



1



1c



1a



1b



2



2a



2b



2c



2e



2d

PLATE CCLXXVII.

FIG. 1. Egg—magnified—of *Ourapteryx sambucata*.

- | | | | | |
|-----|---|---|---|----------------------|
| 2. | „ | „ | „ | Rumia crataegata. |
| 3. | „ | „ | „ | Cabera exanthemaria. |
| 4. | „ | „ | „ | Bapta taminata. |
| 5. | „ | „ | „ | Macaria alternata. |
| 6. | „ | „ | „ | Halia wauaria. |
| 7. | „ | „ | „ | Fidonia atomaria. |
| 8. | „ | „ | „ | Numeria pulveraria. |
| 9. | „ | „ | „ | Scoria dealbata. |
| 10. | „ | „ | „ | Selenia illustraria. |

*
* * *From drawings by Mr. E. Wheeler.*

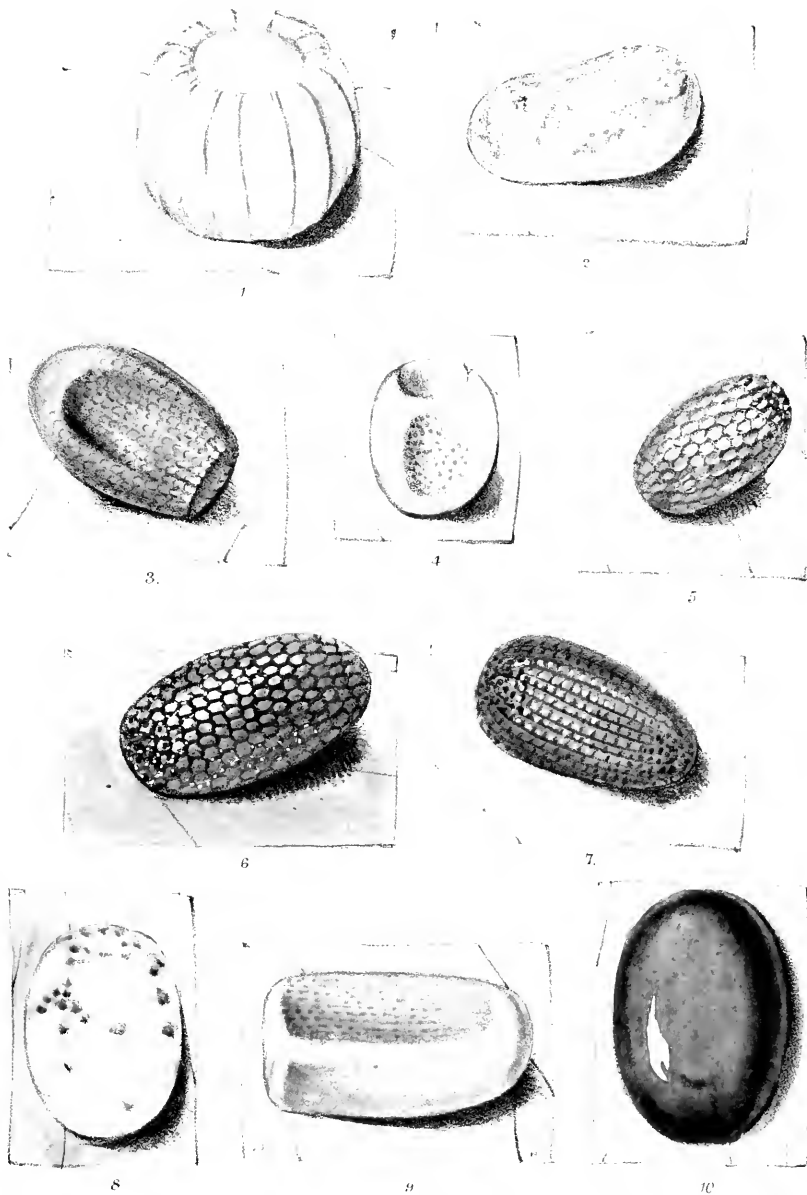


PLATE CCLXXVIII.

- FIG. 1. Egg—magnified—of *Ennomos alniaria*.
 2. " " " " *fuscantaria*.
 3. " " " " *erosaria*.
 4. " " " " *angularia*.
 5. " " " *Crocallis elinguaris*.
 6. " " " *Pericallia syringaria*.
 7. " " " *Epione apiciaria*.
 8. " " " *Metrocampa margaritata*.
 9. " " " *Ellopiopsis fasciaria*.
 10. " " " *Biston hirtaria*.

From drawings by Mr. E. Wheeler.

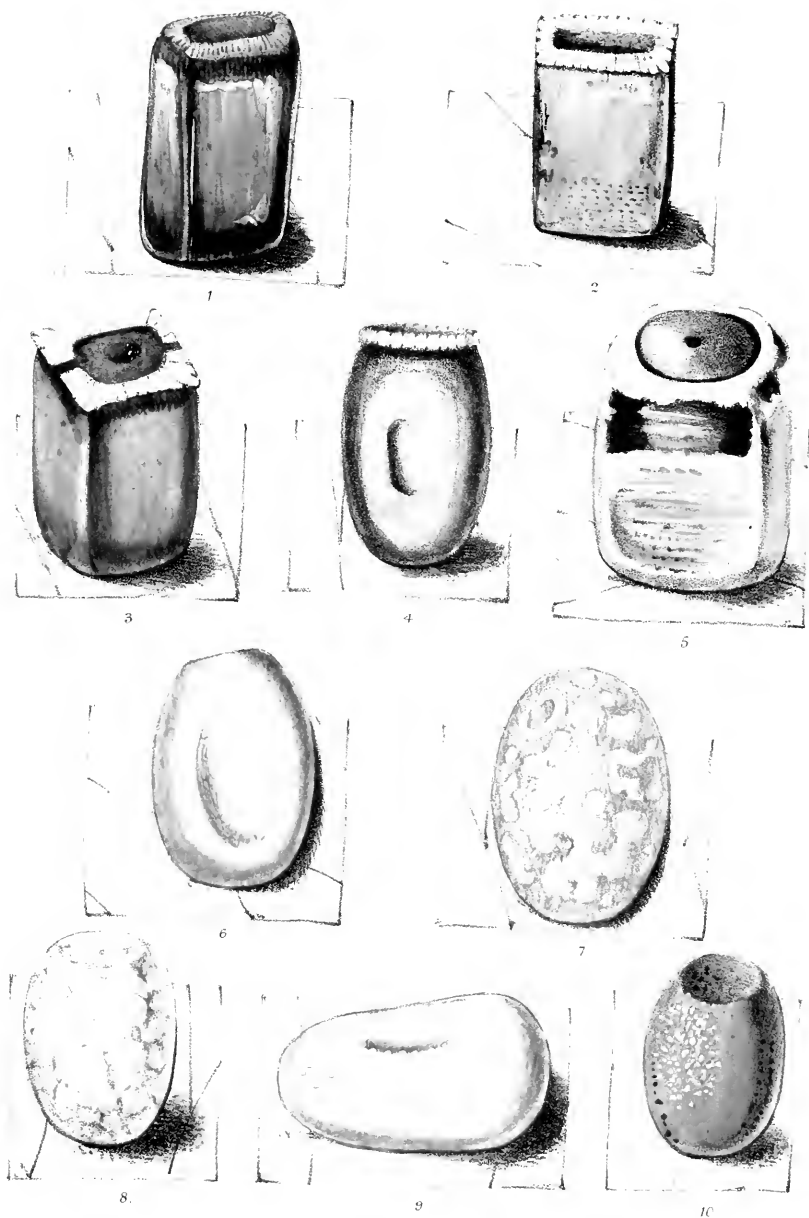


PLATE CCLXXIX.

- FIG. 1. Egg—magnified—of *Tephrosia biundularia*.
 2. „ „ „ „ *extersaria*.
 3. „ „ „ „ *punctulata*.
 4. „ „ „ „ *Boarmia rhomboidaria*.
 5. „ „ „ „ *Hemerophila abruptaria*.
 6. „ „ „ „ *Abraxas ulmata*.
 7. „ „ „ „ *Lomaspilis marginata*.
 8. „ „ „ „ *Phorodesma bajularia*.
 9. „ „ „ „ *Ephyra trilinearia*.
 10. „ „ „ „ *omicronaria*.

* * *From drawings by Mr. E. Wheeler.*

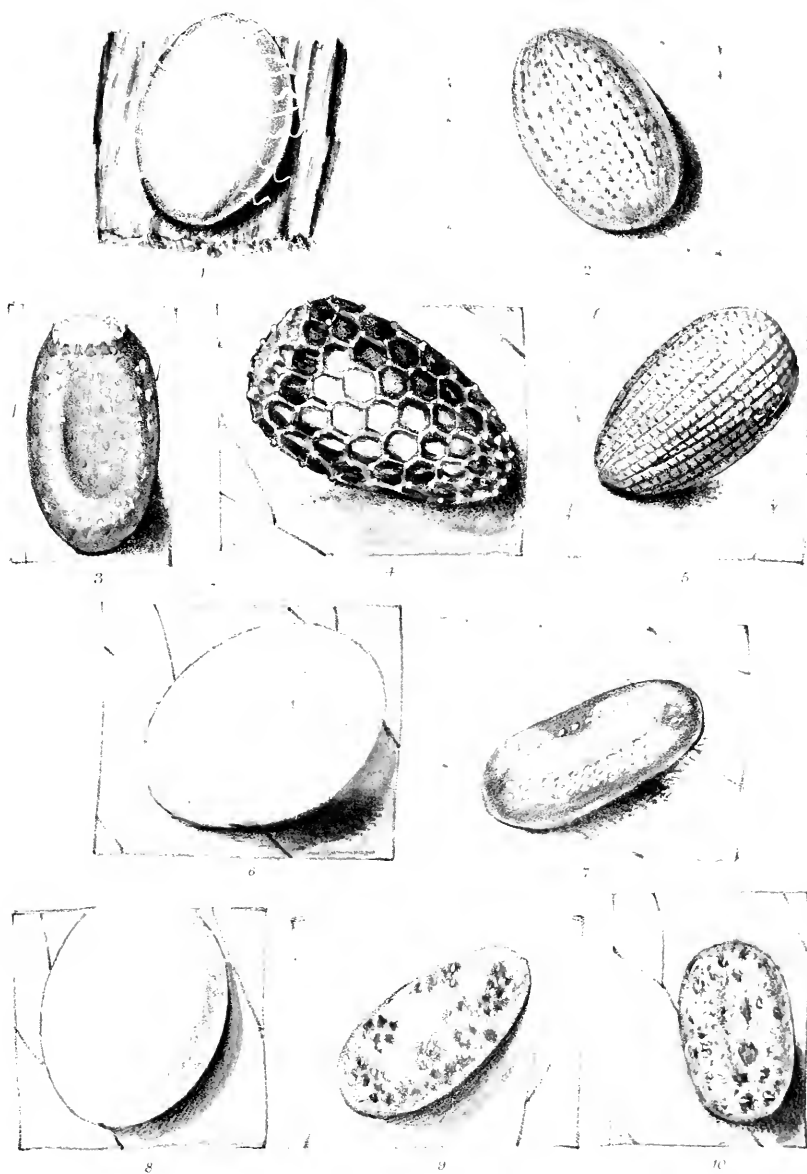
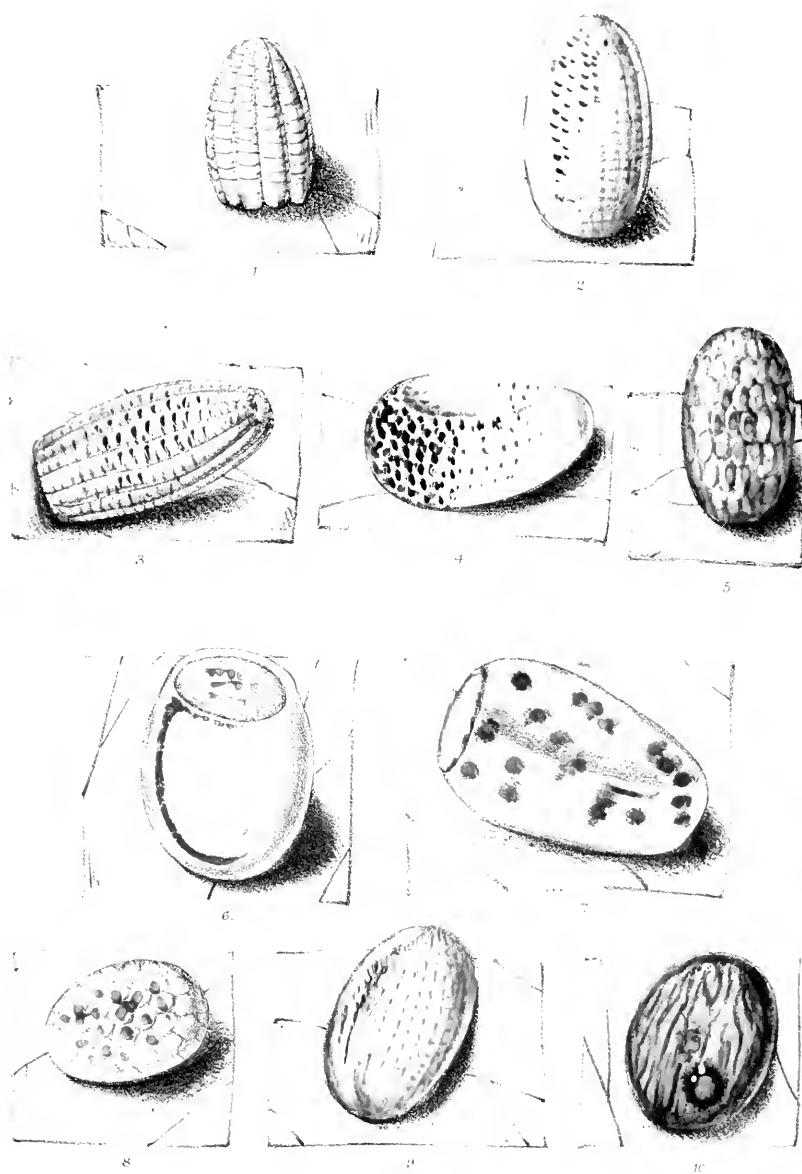
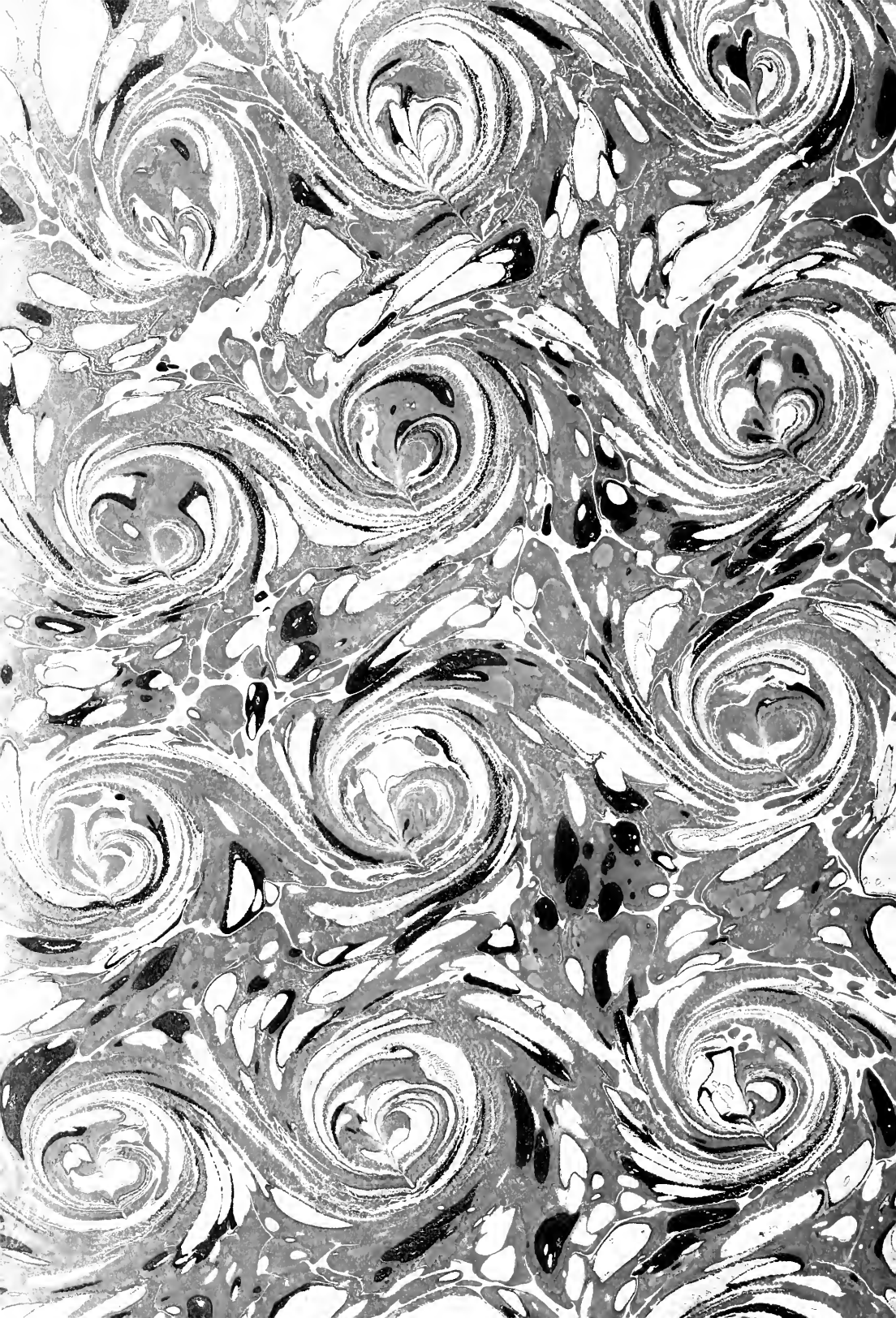


PLATE CCLXXX.

- FIG. 1. Egg—magnified—of *Acidalia ochrata*.
 2. „ „ „ „ *promutata*.
 3. „ „ „ *Timandra imitatoria*.
 4. „ „ „ *Coremia pectinitaria*.
 5. „ „ „ „ *multistrigaria*.
 6. „ „ „ „ *Cidaria pyraliata*.
 7. „ „ „ „ *testata*.
 8. „ „ „ „ *Camptogramma bilineata*.
 9. „ „ „ „ *Lobophora lobulata*.
 10. „ „ „ „ *Eubolia bipunctata*.

From drawings by Mr. E. Wheeler.





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